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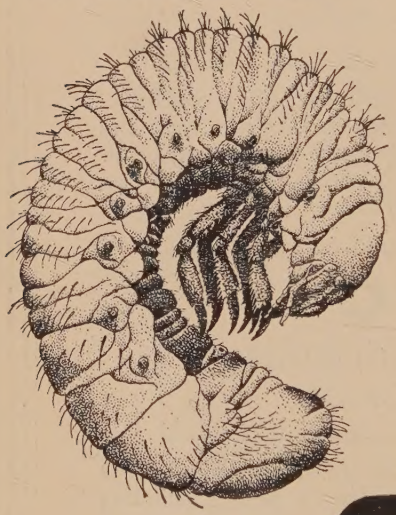

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EDITORIAL

THE TRANSLITERATION OF RUSSIAN, SERBIAN AND BULGARIAN

In February 1953, the Royal Society published a pamphlet * containing and explaining a new system for the transliteration of the Cyrillic letters of the Russian, Serbian and Bulgarian alphabets into the English alphabet, adopted it for use in its own publications, and recommended its adoption by all bodies concerned with the citation, abstracting or indexing in English of scientific papers in which any of the three alphabets are used. This system has received wide adoption and will be used in the publications of the Commonwealth Institute of Entomology issued in and after 1954.

The new system has advantages over some of the existing ones on grounds of pronunciation, printing and indexing, and over all of them in that it provides completely unambiguous transliteration. Its freedom from ambiguity means that the reader of the transliterated word or name can know the exact spelling in the original even if he does not know the language concerned. For this reason, the practice, hitherto adopted in this *Review*, of printing authors' names in Cyrillic type as well as in transliterated form will no longer be required. If necessary, the Cyrillic letters represented by the English ones can be ascertained from the table printed overleaf, which is taken from the Royal Society's pamphlet. This table has three columns. The first shows the English letters and combinations (in English alphabetical order) and the third shows the Cyrillic letters transliterated by them. The second shows the initials of the languages (Russian, Serbian and Bulgarian) to which the transliterations apply.

* **The Transliteration of Russian, Serbian and Bulgarian for Bibliographical Purposes.**—12 pp., 3 tables. Prepared by H. S. Bushell, M.A., with an Introduction by Sir Cyril Hinshelwood, Foreign Secretary, the Royal Society, and Sir Mortimer Wheeler, Secretary, the British Academy. London, the Royal Society, 1953. Price 1*s*.

(1483) Wt. P9/3884 3/54 E.P. Ltd. Gp. 566. [A]

TABLE OF ENGLISH LETTERS AS USED FOR TRANSLITERATION FROM RUSSIAN, SERBIAN AND BULGARIAN

English Letters	Initials of Languages	Cyrillic Letters	English Letters	Initials of Languages	Cyrillic Letters
a	R S B	А а	p	R S B	П п
b	R S B	Б б	r	R S B	Р р
ch	R S B	Ч ч	s	R S B	С с
d	R S B	Д д	sh	R S B	Ш ш
e	R S B	Е е	shch	R	Щ щ
ë	R	Ё ё	sht	B	Щ щ
é	R	Э э	t	R S B	Т т
ê	R B	Ъ ъ	t'	R B	ТЬ ть
f	R S B	Ф ф	t'	S	Ћ ћ
g	R S B	Г г	th	R	Θ θ
i	R S B	И и	ts	R S B	Ц ц
ī	R	І і	t-s	R S B	ТС тс
ĭ	R B	Й й	u	R S B	У у
j	S	Ц ц	ŭ	B	Ъ ъ
j'	S	Ъ ђ	ū	B	Ж ж
k	R S B	К к	v	R S B	В в
kh	R S B	Х х	y	S	J j
l	R S B	Л л	ȳ	R	Ы ы
l'	R B	ЛЬ ль	ў	R	V v
l'	S	Љ љ	ya	R B	Я я
m	R S B	М м	yu	R B	Ю ю
n	R S B	Н н	z	R S B	З з
n'	R B	НЬ нь	zh	R S B	Ж ж
n'	S	Њ њ	‘	R	Ъ ъ
o	R S B	О о	’	R B	Ь ь

Notes.

The use of l', n' and t' in Russian and Bulgarian (where they are not transliterations of a single letter, but merely l, n or t followed by the soft sign) is included to emphasise the fact that they are used for single letters only in Serbian.

Shch and sht invariably represent the letter Щ in Russian and Bulgarian respectively, since the pairs of letters (ШЧ in Russian and ШТ in Bulgarian) seem never to occur consecutively in the respective languages.

da Costa Lima (A.). **Agromizideos (Diptera) do tomateiro e de orquídeas.** [Agromyzids (Diptera) on Tomato and Orchids.]—*Arq. Inst. biol.* **20** pp. 35–38, 2 pls. São Paulo, 1951. (With a Summary in English.)

Of the two species of Agromyzids dealt with, one, *Melanagromyza* (*Agromyza*) *orchidearum*, is described as new from adults reared from larvae found mining the roots of orchids of the genera *Cattleya* and *Laelia* in Santos, Brazil, and the other, which was found mining the stems of tomato in Colombia, is considered to be identical with or closely related to *M.* (*A.*) *caerulea* (Mall.), the original description of which is quoted.

Silberschmidt (K.). **Influência de doses elevadas de BHC no desenvolvimento de cafeeiros em vasos.** [Influence of high Dosages of BHC on the Development of Coffee Plants in Pots.]—*Arq. Inst. biol.* **20** pp. 217–248, 3 pls., 29 refs. São Paulo, 1951. (With a Summary in English.)

BHC is widely used against *Stephanoderes hampei* (Ferr.) on coffee in Brazil and has been shown there not to affect the flavour of the beans [*cf.* *R.A.E.*, A **41** 279, etc.]. In view of the possibility that growers may apply it at excessive rates, however, laboratory tests were carried out in 1948–51 on its phytotoxicity at high dosages. Coffee plants about 2 ft. high in pots 8 ins. high and 8 ins. in diameter at the top were used, and a BHC dust containing 6 per cent. γ isomer was applied at a little over an ounce per plant, corresponding to the amount of BHC that would normally be applied in a year to full-sized plants in the field [*cf.* **39** 26]. This dose was either mixed directly with the upper half of the soil or applied to the leaves at the time of transplanting or applied in the same ways in three nearly equal amounts at intervals of six weeks. The soil treatments caused early wilting, inhibition of growth and death of about half the plants within almost two years. Dusting caused slight scorching but no early suppression of growth, though there was a reduction in root length and in the number of leaves, as compared with the controls, after three years. The controls were untreated or similarly treated with talc, and slight mortality occurred in both series.

de Figueiredo jr. (E. R.). **Uma nova praga das orquidáceas: *Tenthecoris figueiredoi* Carvalho, 1950 (Hemiptera, Miridae, Bryocorinae).** [A new Pest of Orchids, *T. figueiredoi*.]—*Arq. Inst. biol.* **20** pp. 249–253, 5 figs., 1 ref. São Paulo, 1951. (With a Summary in English.)

Descriptions are given of the nymphs and adults of both sexes of *Tenthecoris figueiredoi* Carvalho, a Mirid that was described in 1950 from material taken on orchids in São Paulo. The orchids attacked were of the genera *Dendrobium*, *Gomesa*, *Oncidium* and *Newtonia*, but since the adults left the orchid houses when development was completed and did not reappear for some time, it is thought that there are alternative food-plants. The eggs were inserted into incisions in the leaves, and the nymphs fed in groups on the dorsal leaf surfaces, complete development lasting about a month. The damage caused was considerable, resulting in chlorosis and sometimes the death of the plants. Good control was given by sprays of 0·05 per cent. DDT or 0·02 per cent. parathion.

Gomes Costa (R.) & Redaelli (D. C.). **Cochonilhas ou coccideas do Rio Grande do Sul.** [Scale Insects or Coccids of Rio Grande do Sul.]—*Bol. Sec. Agric. Rio Grande do Sul* Sér. C no. 152, 107 pp., 68 figs., 46 refs. Porto Alegre, 1949.

A list is given of 62 species of Coccids that have been found in the State of Rio Grande do Sul, Brazil, together with descriptions, records of food-plants and notes on habits and classification.

Ferreira Lima (A. D.) & others. **Gafanhotos no sul do Brasil.** [Locusts in southern Brazil.]—*Bol. fitossanit.* **4** (1947–50) no. 1–2 pp. 1–113, 38 pls., 3 figs., 3 fldg. maps. Rio de Janeiro [?1951].

This report, to which five authors have contributed, contains records of the work carried out in southern Brazil during an outbreak of *Schistocerca cancellata* (Serv.) in 1945–48. In the introduction (pp. 1–12), Ferreira Lima briefly reviews the history of outbreaks of this locust in Brazil and the work of international congresses held to co-ordinate control measures against it throughout its area of distribution, leading in 1948 to the setting up of the Interamerican Permanent Anti-Locust Committee and commissions for dealing with research and control.

In the first section (pp. 13–18), the same author gives details of the preparatory measures adopted in 1946, when swarms of *S. cancellata* entered the States of Rio Grande do Sul and Santa Catarina in July, from Argentina, Uruguay and Paraguay, and threatened Paraná and São Paulo. Maps are given showing the distribution of *S. cancellata* in southern Brazil in 1946–49.

In the second section (pp. 19–33), A. G. d'Araujo e Silva summarises the results of 375 experiments carried out between November 1946 and March 1948 on the control of hoppers and adults. The 44 commercial products tested comprised dusts, sprays and baits of BHC, dusts and sprays of chlordane and parathion and sprays of dinitrophenol, DNC, DDT and a mixture of DDT and chlordane. BHC was the most effective and economical, and dusts containing 0·4, 0·5–0·7 and 1 per cent. γ isomer are recommended against hoppers in the first and second instars, older hoppers, and adults, respectively, and a bait of 100 lb. bran, 2·2 lb. BHC (containing 2·5 per cent. γ isomer) and 7 gals. water, to which sugar or molasses was later added, against the hoppers.

The third section (pp. 35–37), by C. H. Reiniger, comprises the instructions issued to affected areas, and the fourth (pp. 39–55), by the same author, contains notes on previous major outbreaks, records of the dates of the appearance of swarms in various municipalities in Rio Grande do Sul in 1947 and a list of the crops attacked. Losses were estimated at about 30 per cent. Oviposition occurred over a wide area and was intense from 8th August. Each egg-pod contained 50–100 eggs, and these hatched in 20–50 days. Flame-throwers and baits and dusts containing BHC were used against the adults and hoppers, and some of the resting swarms were dusted from aeroplanes. The BHC treatments were very effective and reduced the amount of damage caused by the hoppers. The natural enemies observed comprised miscellaneous predators, *Sarcophaga* (*Acridiophaga*) *caridei* Brèth. and *Hexamermis acridiorum*; parasitism by the last two reached 52 and 63 per cent., respectively, in 1949.

In the fifth section (pp. 57–93), Ferreira Lima describes the invasion of the State of Santa Catarina by swarms of *S. cancellata* from Rio Grande do Sul at the end of August 1946 and gives records of the extent and date of oviposition in various localities throughout the State. Attempts to prevent hatching by ploughing, digging or rolling the soil were largely unsuccessful

and merely served to scatter the hoppers over a wider area. Hatching occurred from late October until December, and sprays of soap and water, kerosene emulsion or arsenicals were of little use against the hoppers. Dinitrophenol was ineffective against the third-instar hoppers, but a dust containing 1 per cent. γ BHC gave complete mortality. Supplies of BHC were limited, and some hoppers completed their development by February, with the subsequent formation of swarms. In June 1947, fresh swarms entered Santa Catarina from the south, covering practically the whole of the State, though it is estimated that the damage was less severe than in the previous year. Attempts were made to control them with dusts containing 1·5 per cent. γ BHC, but these gave good results only when the locusts rested in accessible places. Records of oviposition are again given. Dusts of 0·6 or 1·5 per cent. γ BHC were successfully applied against the hoppers, and BHC baits and sprays were also effective. The return flight to Argentina began in March–May. Numerous predators were again observed; the parasites found were probably *S. caridei* and *H. acridiorum*, of which the latter gave 80 per cent. mortality in one area. Attempts to control the overwintering adults were not very successful, since many localities were inaccessible for treatment, and swarms were still present in the following year. Other swarms entered Santa Catarina from Paraná and Rio Grande do Sul in August 1948, and ovipositions occurred throughout the State in October and November. BHC dusts were of little use against the adults but gave very satisfactory results when applied against the hoppers, few developing beyond the third instar. Damage to crops was slight.

In the sixth section (pp. 95–109), J. Alves jr. describes the campaign conducted against the locust in Paraná, where swarms entered from the south in September 1946 and oviposited in October. Mechanical means of destruction were of little use against the hoppers, but dinitrophenol and BHC dusts and arsenical baits gave good results. In 1947, swarms again entered from the south, and oviposition occurred from September until January 1948. Dusts containing 0·3–0·75 per cent. γ BHC were very effective against the hoppers, and BHC baits also gave good control.

In the seventh section (pp. 111–113), A. M. Ribeiro filho states that swarms entered Mato Grosso from Paraguay in mid-October and early November 1948 and oviposited in three districts. BHC dusts containing 1 per cent. γ isomer were applied against the adults, in some cases from an aeroplane, and also against the hoppers, and gave rapid control of the latter.

Kasting (R.) & Harcourt (D. G.). **Parathion Residues of Cauliflower Heads after Spraying.**—*Sci. Agric.* **32** no. 6 pp. 299–303, 5 refs. Ottawa, 1952.

Although the manufacturers recommend that parathion should not be applied to cauliflowers within 30 days of harvest or after the heads are formed, whichever date is earlier, to avoid dangerous residues, insect attack often develops shortly before harvest, and applications are then sometimes made. Direct contamination of the heads with the spray is probably of little importance, since they are protected by the outer leaves, which are tied over them when they are about an inch in diameter, and the residues on those sprayed before reaching that size would be greatly diluted as a result of growth; there is, however, some risk of indirect contamination resulting from the absorption and translocation of parathion from sprayed leaves [*cf. R.A.E.*, A **39** 181]. The importance of residues from applications made near to harvest was accordingly investigated in Canada. When

cauliflower heads sprayed up to three times at approximately weekly intervals with 1 lb. 15 per cent. wettable parathion per 100 gals. were subjected to chemical analysis, no residue could be detected, although the last application was made about a fortnight before harvest and the leaves were not tied till after the second application, but a quantitative biological test in which *Drosophila melanogaster* Mg. was exposed to benzene extracts indicated the possible presence in or on the treated heads of a residue of less than 0·06 part per million, which is well below the unofficial tolerance of 1·5 p.p.m.

SHERMAN (M.) & MITCHELL (W. C.). **Control of Sweetpotato Weevils and Vine Borer in Hawaii.**—*J. econ. Ent.* **46** no. 3 pp. 389–393, 3 refs. Menasha, Wis., 1953.

Field-plot tests were carried out in Hawaii in 1950–52 to compare various treatments with DDT sprays and dusts for the control of the weevils, *Euscepes postfasciatus* (Fairm.) and *Cylas formicarius elegantulus* (Summers), and the Pyralid, *Omphisa anastomosalis* (Gn.), on sweet potato [*cf. R.A.E.*, A **40** 73], and the effect of DDT with that of five other organic insecticides when applied to the soil to control the two weevils.

Cuttings of a susceptible variety were dipped in February in a suspension of 2 lb. DDT per 100 U.S. gals., with a depositing agent and adhesive, before planting, and sprayed with 0·5, 1 or 2 lb. DDT per 100 U.S. gals. 10 and 16 weeks, 10, 13 and 16 weeks, or 5, 10, 13, 16 and 18 weeks after planting. The sprays were applied at the rate of 250–320 U.S. gals. per acre, and care was taken to treat the lower part of the main stems and the surrounding soil; the rapid increase of a mite identified as *Petrobia* sp. on plants sprayed five weeks after planting necessitated the addition of 6 lb. 95 per cent. wettable sulphur per 100 U.S. gals. to all subsequent sprays. Examination 20 weeks after planting showed that 33 per cent. of the stems of dipped but unsprayed plants were infested by *Omphisa*, that five applications of 2 lb. DDT reduced this percentage to 0·9 and that control decreased as the concentration and the number of applications of DDT decreased. On the unsprayed plants, 77 per cent. of the stems were infested by the weevils, and the best control (15·5–20·8 per cent. infested stems) was given by five applications of DDT at any of the concentrations tested. Examination of all tubers three or more inches in length at the same time showed that over 40 per cent. of those from unsprayed plants were infested by the weevils and that all treatments except 2–3 applications of 0·5 lb. DDT gave excellent control.

To determine whether dusts could be substituted for sprays, the cuttings were dipped just before planting in January, and the plants were treated 2, 3 or 5 times with a dust of 2 or 5 per cent. DDT and 50 per cent. sulphur. The dusts were applied at 14–41 lb. per acre at the base of the plants, and examination 20 weeks after planting showed that all treatments were less effective than spraying; 43 per cent. of the stems were infested by *Omphisa* on undusted plants and none of the treatments gave more than 42·5 per cent. control. All stems were infested by the weevils, regardless of treatment; 58 per cent. of the tubers were infested on undusted plants, and five applications of 5 per cent. DDT reduced this to 9·1 per cent., but all other treatments were relatively ineffective.

In one test of soil treatments, dusts containing 5 per cent. γ BHC (as lindane), chlordane, aldrin or dieldrin in pyrophyllite and a parathion suspension were applied at rates of 5, 2·5 and 1·25 lb. active ingredient per acre and hoed into the top 2–3 inches of soil a week before the cuttings were planted; these were dipped immediately before planting in suspensions of

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the insecticide used to treat the soil, at concentrations of 0·25 per cent. for chlordane and 0·031 per cent. for the others. Examination after 22 weeks showed considerable reductions in weevil infestation in the stems of all treated plants and in the tubers of all but those treated with lindane at 5 lb. per acre. No differences were found in the flavour of the cleaned, cured and baked tubers from treated and untreated plots. In another test, the soil was sprayed with suspensions of wettable powders to give 10, 5 or 2·5 lb. actual DDT, 5, 2·5 or 1·25 lb. lindane, 2·5 or 1·25 lb. aldrin, 5 or 2·5 lb. dieldrin or parathion or 5 or 1·25 lb. chlordane per acre four days before planting and harrowed to a depth of three inches. The cuttings were not dipped before planting, and examination 23 weeks later showed that only dieldrin at 5 lb. and DDT at 10 lb. significantly reduced tuber infestation. It is doubtful whether the differences in formulation and method of application would account for the difference in results obtained in these two experiments, so that dipping the cuttings before planting appears necessary for control with most of the insecticides used. Soil treatment with DDT was as effective as sprays against the weevils, which do most of their damage below the soil surface, but is useless against *Omphisa*, which does not pass any stage of its life-cycle in the soil.

Taschenberg (E. F.). **Currant Borer Control Studies.**—*J. econ. Ent.* **46** no. 3 pp. 394–400, 2 figs., 6 refs. Menasha, Wis., 1953.

Aegeria (*Ramosia*) *tipuliformis* (Cl.) was so abundant in 1946–51 in the two principal areas of New York in which red currants are grown that control measures were necessary. Observations in Chautauqua County showed that the moth has one generation a year; the eggs are deposited singly on the bark and hatch in 1–2 weeks. The larvae bore through the bark and woody tissue to the pith, overwinter when nearly mature and pupate within the canes in early May. Adult emergence begins in late May or early June. Canes one or more years old, on which the fruit is mainly produced, are most often infested, but any cane may be attacked when infestation is heavy. The destruction of pith and woody tissue weakens the canes and may reduce yields for several years. Cutting out and burning infested shoots has been recommended for control, but is considered impracticable in commercial plantings.

In tests in 1948–51 in which sprays were applied at 350 U.S. gals. per acre with a power sprayer and a hooded boom, parathion proved very effective, giving at least 90 per cent. control when applied at 1·5 lb. 25 per cent. or 2 lb. 15 per cent. wettable powder per 100 U.S. gals. 10–14 days after the first moths emerged. Control was not improved by a second application after a week. In laboratory tests, parathion was toxic to the eggs, giving more than 90 per cent. kill at 4 oz. 15 per cent. powder per 100 U.S. gals., and this probably accounts for the good field results. Metacide [6·2 per cent. parathion, 24·5 per cent. methyl-parathion and 2·7 per cent. related organic phosphates] at 3 fl. oz. per 100 U.S. gals. was also an effective ovicide.

In 1948, up to three applications of DDT or one of DDD, both at 4 lb. 50 per cent. wettable powder per 100 U.S. gals., were much less effective than one of 2·25 lb. 25 per cent. parathion, and in 1951 1 lb. EPN-300 (27 per cent. ethyl p-nitrophenyl thionobenzenephosphonate) and 8 fl. oz. Metacide 50 (a mixture of parathion and methyl-parathion [*cf. R.A.E.*, A **42** 11]) per 100 U.S. gals. were rather less effective than 1·5 lb. 15 per cent. parathion in one or two applications, and 2 lb. 25 per cent. wettable malathon and 8 fl. oz. Potasan (50 per cent. miscible diethoxythiophosphoric

acid ester of 4-methyl-7-hydroxy coumarin [O,O-diethyl O-7-hydroxy-4-methyl-coumaryl thiophosphate]) per 100 U.S. gals. both gave poor control when applied once or twice.

Harvest residues from parathion treatments did not exceed 0·42 part per million, whereas those from DDT reached 21·1 p.p.m. after one application 38 days before harvest.

FLITTERS (N. E.) & MESSENGER (P. S.). **Bioclimatic Studies of Oriental Fruit Fly in Hawaii.**—*J. econ. Ent.* **46** no. 3 pp. 401–403, 2 refs. Menasha, Wis., 1953.

Investigations were carried out in Hawaii in 1949 to determine the effect on *Dacus ferrugineus dorsalis* Hend. of the climates of selected localities in the United States, as a basis for predicting the limits of its distribution and its potential importance should it spread there [*cf. R.A.E.*, A **39** 175].

Cabinets were constructed in which the temperature and humidity were controlled by specially cut cams to correspond with those recorded from the localities in question, and the effects of sunlight were simulated by means of ultraviolet and infrared lamps controlled by clocks. Details are given of the methods of manipulating the experimental insects and operating the cabinets. In each climate-simulation study, information was obtained on the durations of the various stages and the preoviposition period, oviposition and fecundity, infestation of fruits, and the development of subsequent generations, and the results were compared with standard values determined under optimum conditions of 80°F. and 60–70 per cent. relative humidity in a constant-temperature cabinet. Conditions simulating the climates of Oceanside, Fresno and Riverside (California), Charleston (South Carolina), Fort Pierce (Florida) and Vincennes (Indiana) were studied from early spring through an entire year, and conditions recorded during the outdoor biological studies on Maui were reproduced in another cabinet to test the reliability of the results.

It was found that the lowest average temperature at which the immature stages of the fruit-fly develop is about 57°F., that temperatures above 70°F. are necessary for the adults to attain sexual maturity in a reasonable time, that twilight temperatures lower than 60° may limit pairing, and that the range of mean temperatures at which the fly reproduces efficiently is 65–80°F. Temperature had a marked effect on the rate of growth of the immature stages [*cf.* **39** 176], and development was greatly inhibited when temperatures seldom reached 70°F. and the average temperature was 60° or less. In general, there was a good correlation between the length of the favourable reproductive periods and the number of progeny. The Florida climate was the most favourable; reproduction continued throughout the year and was at a high rate for most of it. In all other cabinets, though reproduction was sometimes high, it ceased during winter.

NEWCOMER (E. J.) & DEAN (F. P.). **DDT and other new Insecticides for Codling Moth Control in the Pacific Northwest.**—*J. econ. Ent.* **46** no. 3 pp. 414–419, 16 refs. Menasha, Wis., 1953.

The authors summarise the results of experiments and observations on the use of DDT and other organic insecticides for the control of *Cydia* (*Carpocapsa*) *pomonella* (L.) on apple, made in the Pacific North-west of the United States in 1944–51. It was shown in 1944–48 that one cover spray of 2 lb. 50 per cent. DDT per 100 U.S. gals. followed by two or three of 1 lb. was much more effective than 6–7 of 3 lb. lead arsenate or cryolite

with mineral oil or 2 lb. xanthone with stove oil, and that omission of the calyx spray did not result in increased infestation.

As repeated applications of DDT were resulting in an accumulation in the soil, other organic compounds were compared with it in 1948–50. Wettable powders containing 15 per cent. parathion or 40 per cent. toxaphene did not improve control when added to the DDT sprays at 0·5 and 1 lb. per 100 U.S. gals., respectively, and gave poorer control when applied alone at 3 lb. per 100 U.S. gals. or to replace DDT in the second and third sprays at 2–3 lb. per 100 U.S. gals., evidently owing to shorter residual toxicity. Replacing DDT by methoxy-DDT (methoxychlor) or adding 1 pint 25 per cent. CS-708 [a 1 : 2 mixture of 1,1-bis(p-chlorophenyl)-2-nitropropane and 1,1-bis(p-chlorophenyl)-2-nitrobutane] per 100 U.S. gals. to it caused some reduction in injury.

DDT treatments had no effect on the size or colour of the apples, and residues at harvest from schedules giving adequate control were well below the accepted limit of 7 parts per million. Growers have applied DDT with outstanding success, and a cumulative effective of its use over large areas for several years has been noticed, control being considerably better in 1950 and 1951 than in 1946.

Anderson (A. D.) & Patton (R. L.). **Efficiency of Sulfhydril Compounds in the Detoxication of Arsenite in two Species of Insects.**—*J. econ. Ent.* **46** no. 3 pp. 423–426, 1 graph, 13 refs. Menasha, Wis., 1953.

In further studies on the action of sulphydryl groups as arsenic receptors in insects [*cf. R.A.E.*, A **40** 102], solutions of sodium metarsenite were injected into adults of *Musca domestica* L. or larvae of *Tenebrio molitor* L. The flies were allowed to ingest methionine or cystine or had cysteine injected into them, and the beetle larvae had cysteine, glutathione or 2,3-dimercaptopropanol (BAL) injected into them not more than 30 minutes after treatment with the arsenite.

No significant decrease in the toxicity of the arsenite to *M. domestica* was observed with methionine, cystine or cysteine, and methionine was found to be itself toxic at high concentrations and to increase the susceptibility of adult females to the arsenite. Cysteine and glutathione caused a slight but insignificant reduction in mortality of *T. molitor*, and BAL was highly effective in detoxifying the arsenite in a 1 : 1 molar ratio at the median lethal dosage.

These results and the evidence from studies on vertebrates indicate that the primary arsenic receptor in the beetle larvae is a sulphydryl-containing compound or system component, other than glutathione, and possibly an oxidative enzyme.

Richardson (B. H.). **Insecticidal Control of Rhodes Grass Scale on St. Augustine Grass Lawns.**—*J. econ. Ent.* **46** no. 3 pp. 426–430, 2 refs. Menasha, Wis., 1953.

The following is based on the author's introduction and summary. *Antonina graminis* (Mask.) injures lawns of St. Augustine grass [*Stenotaphrum secundatum*] severely during summer in the Winter Garden area of Texas, where it has been found every year since 1948. The mature adults occur on the roots during the winter, and the attached non-motile adults and attached young round the nodes beneath the base of the grass blades in spring, summer and autumn; crawlers were observed as late as December in 1949 and as early as 20th March in 1950.

Investigations in 1948–50 showed that parathion gave good control. It

was almost as effective at a dosage of 0·125 lb. in 200 U.S. gals. water per acre as at 0·313–2·5 lb. in 500 U.S. gals. water per acre and did not give significantly less control at the former rate than at 5 lb. in 1,000 U.S. gals. water per acre. There was no significant difference between applications of 25, 50, 100 and 200 lb. 1 per cent. parathion dust per acre. Treatments were most effective when repeated at weekly intervals and most persistent during cool weather. Chlordane, γ BHC, DDT and rhothane [DDD] as wettable powers applied at 10 lb. toxicant in 1,000 U.S. gals. water per acre, 0·8 lb. TEPP [tetraethyl pyrophosphate], 0·5 lb. aldrin or dieldrin in emulsions or wettable powders, 12 lb. calcium sulphate or 0·25 lb. EPN [ethyl p-nitrophenyl thionobenzenephosphonate] in 200 U.S. gals. water per acre, and 0·5 lb. aldrin and dieldrin in 1 per cent. dusts were ineffective, and 1·5 per cent. summer oil emulsion, though somewhat better, injured the grass.

Lukefahr (M. J.) & Gaines (J. C.). **Control of immature Stages of the Boll Weevil.**—*J. econ. Ent.* **46** no. 3 pp. 430–433, 2 refs. Menasha, Wis., 1953.

Experiments were carried out at College Station, Texas, in 1952 to compare several organic insecticides for the control of *Anthonomus grandis* Boh. in cotton squares and bolls. In tests in which punctured squares arranged on paper were sprayed in a large cylinder and transferred after three minutes to clean rearing cages in the insectary, treatment at the rate of 0·33 lb. actual dieldrin, heptachlor, aldrin or endrin [*cf. R.A.E.*, A **41** 268, note], 1·5 lb. chlordane or 3 lb. toxaphene per acre prevented any emergence from about 90 per cent. or more of the squares and were more effective than 0·33 lb. γ BHC, parathion or methyl-parathion. When the sprayed squares were exposed in cages in the field, mortality was generally lower and dieldrin and heptachlor were more effective than any other material. EPN [ethyl p-nitrophenyl thionobenzenephosphonate] at 0·33 lb. was very effective in the first test but not in the second. No dead larvae were found in the squares, and a high proportion of the weevils had developed to the adult stage; up to about half of these adults were dead or paralysed, and paralysed examples placed on cotton plants did not recover. All the chlorinated hydrocarbons killed weevils in bolls sprayed with them, but mortality was lower than in squares. When plants bearing punctured squares were freed from adult weevils, enclosed in the cylinders and sprayed with the same materials, aldrin was almost as effective as dieldrin and both were significantly better than any other material, but mortality was much lower than in the laboratory tests, probably because the leaves prevented thorough coverage of the squares. Examination of squares collected from plants sprayed in the field every five days throughout the season with a mixture of toxaphene and DDT (2 : 1) at about 3 lb. toxicant per acre, one of γ BHC and DDT (3 : 5) at 0·95 lb., EPN at 0·78 lb., or parathion, methyl-parathion, dieldrin, heptachlor or aldrin at 0·25–0·29 lb. (the doses currently recommended) showed that none of these treatments caused mortality or paralysis of weevils developing within the squares; this may have been due to dispersal of spray particles by the wind and inferior coverage of the squares.

Kulash (W. M.). **Insecticidally treated Seed for Wireworm Control.**—*J. econ. Ent.* **46** no. 3 pp. 433–441, 7 refs. Menasha, Wis., 1953.

The following is largely based on the author's summary. In preliminary laboratory tests with chlordane as a seed coating on maize in North

Carolina, a 50 per cent. wettable powder with an adhesive was more effective against the wireworm, *Melanotus communis* (Gylh.), which is one of the most injurious pests of field maize in the eastern part of that State, than a 5 per cent. dust or a 75 per cent. emulsion concentrate. Further laboratory tests showed that aldrin, heptachlor and dieldrin in 25 per cent. wettable powders and γ BHC as lindane in a 75 per cent. wettable powder were also effective in killing wireworms and protecting maize from attack. The heavier applications did not always give a greater kill than lighter ones; 25 per cent. wettable aldrin gave 75 and 48 per cent. mortality when used at 2·28 and 4·56 gm. per 450 gm. seed, respectively, and 25 per cent. wettable dieldrin killed 46 and 33 per cent. at 0·566 and 2·28 gm. per 450 gm. seed. Similar results were obtained at soil temperatures of 60 and 74°F. with aldrin, dieldrin, heptachlor and lindane, but 15 per cent. wettable parathion gave 21 per cent. kill at 74° and 60 per cent. at 60°F. In three laboratory tests with treated oats, wireworm kills did not show any difference between treatments, but the percentage injury to the seeds and stems, though inconsistent, indicated that aldrin, dieldrin and lindane were more effective than chlordane or heptachlor. There was no evidence that the seed was injured by any of the insecticides.

Treatments were less effective in the field than in the laboratory. In replicated tests, applications of 1 lb. aldrin, 2 lb. dieldrin, heptachlor or lindane or 5 lb. chlordane per acre, either broadcast or mixed with fertiliser, gave better protection of maize than coating with 22·8 gm. 25 per cent. aldrin or lindane or 45·6 gm. 50 per cent. chlordane or 25 per cent. dieldrin or heptachlor per 4·5 kg. seed per acre, and surveys of 110 acres of maize planted with lindane-treated seed and 600 acres planted with untreated seed showed no great difference in the extent of damage to the stand by a heavy infestation of wireworms.

Hamilton (C. C.). **New Acaricides against Mites attacking Nursery Plants.** —*J. econ. Ent.* **46** no. 3 pp. 442–445, 1 ref. Menasha, Wis., 1953.

Mites cause considerable damage to plants grown in nurseries, and some of the newer acaricides were tested in New Jersey for effectiveness, as measured by reduction in living mites and phytotoxicity.

Brevipalpus inornatus (Banks) [of which *Tenuipalpus bioculatus* McG. (*R.A.E.*, A **3** 306) and *T. pseudocuneatus* Blanch. (**32** 340) have been found by McGregor and Pritchard & Baker, respectively, to be synonyms] was found on azaleas in the field and greenhouse at a nursery in northern New Jersey in 1946. Greenhouse plants were sprayed with a hand pump on 29th July and 18th August and examined on 6th, 14th and 28th August or sprayed on 13th August and examined on 23rd August and 3rd September. Of the wettable powders tested, Ovotran WP (50 per cent. p-chlorophenyl p-chlorobenzenesulphonate), Aramite WP (15 per cent. 2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite) and EPN-300 (27 per cent. ethyl p-nitrophenyl thionobenzenephosphonate) at 1–2 lb. per 100 U.S. gals., and of the emulsion concentrates, Geigy 338 (25 per cent. ethyl ester of 4,4′-dichlorobenzillic acid), Dimite (25 per cent. 1,1-bis(p-chlorophenyl)-ethanol) and Ovotran (20 per cent. active ingredient) at 1–2 pints and Chemite (19·35 per cent. p-chlorophenyl p-chlorobenzenesulphonate, 1·8 per cent. rotenone and other cubé resins and 57·85 per cent. solvent and emulsifier) at 1–2 quarts per 100 gals. all gave very good control. Malathon at 1–2 U.S. pints 50 per cent. emulsion concentrate or 2–4 lb. 25 per cent. wettable powder and Metacide 50 (an emulsion concentrate containing 50 per cent. of a 1 : 3 mixture of parathion and methyl-parathion) at 8–16 oz. per 100 U.S. gals. were erratic, and schradan at 3–6 oz. per acre and Systox

(42 per cent. O,O-diethyl O-2-(ethylmercapto)ethyl thiophosphate [demeton]) at 3–6 oz. active ingredient per 100 U.S. gals. gave very poor kills. None of these materials damaged the plants.

On outdoor plants of *Ilex bullata* infested by *Paratetranychus ilicis* (McG.), sprays of 1–2 lb. Ovotran WP, Aramite WP or EPN-300, 2–4 lb. 25 per cent. wettable malathon, 1–2 U.S. pints Geigy 338, 50 per cent. malathon emulsion concentrate or Dimite or 8–16 oz. Metacide 50 per 100 U.S. gals., applied with a hand pump on 9th June, gave very good control on 12th and 17th June, and moderately good control until about mid-August, when infestation began to increase; none of the sprays injured the plants. Application on 13th June of 1 quart Geigy 338 or 1 pint Ovotran emulsion per 100 gals. with a hydraulic sprayer and of 1 gal. malathon emulsion per 100 gals. with a mist blower to various species of *Ilex*, *Juniperus* and *Thuja* gave excellent control of *P. ilicis* and the two-spotted spider mite [*Tetranychus bimaculatus* Harvey] on 18th June and 23rd July without injuring the plants. Treatment of various species of *Buxus* with 1 gal. Aramite emulsion concentrate (25 per cent. active ingredient) per 100 gals. with a mist blower in late August gave good control of mites without injuring the plants.

These results were confirmed by those of commercial work in which Ovotran, Aramite, Geigy 338, Dimite, Chemite and EPN-300 applied by hydraulic sprayer or mist blower usually gave good control for 5–6 weeks; Metacide and malathon were slightly less effective. The new materials were superior to tetraethyl pyrophosphate or parathion, most of them having a better ovicidal effect and a longer residual action.

Fleming (W. E.) & Maines (W. W.). **Persistence of DDT in Soils of the Area infested by the Japanese Beetle.**—*J. econ. Ent.* **46** no. 3 pp. 445–449, 13 refs. Menasha, Wis., 1953.

The following is substantially the authors' summary. An investigation was begun in 1943 to determine the persistence of DDT in soils representative of the region of the eastern United States that is infested by *Popillia japonica* Newm. Samples of 84 mineral soils and one muck soil from eight States were treated with DDT at a rate equivalent to 25 lb. per acre to a depth of 3 ins.; a few were also treated at 50 lb. The DDT remaining in the soils was estimated at intervals by bioassay with third-instar larvae of *P. japonica*. The results showed that averages of 97, 90, 79, 64, 56 and 44 per cent. of the DDT applied at 25 lb. per acre were still present after 1, 2, 3, 4, 6 and 8 years, respectively, and the loss was much the same after treatment at 50 lb. The loss was less than in other tests in which the DDT was applied as a top-dressing to turf, but the persistence was modified by factors other than the method of application. After eight years, about half the DDT remained in two-thirds of the soils and a quarter or more in nine-tenths of them. A tendency for persistence to increase from north to south indicated that there might be some relation between it and organic content. Persistence was greatest in sand and least in muck soil, and much the same in all types of loam. The pH seemed to have no effect within the range of 4–7·5. The more organic matter in the soil the less persistent was the DDT.

Chandler (S. C.). **Life History and Control of Pecan Spittlebug.**—*J. econ. Ent.* **46** no. 3 pp. 450–454, 4 figs., 3 refs. Menasha, Wis., 1953.

Records are given of the dates of appearance of the nymphs and adults of the two generations of *Clastoptera achatina* Germ. on pecan in Illinois in

1951–52 [*cf. R.A.E.*, A **41** 148] and of the results of inspection of the trees for eggs and egg-slits in the autumn of 1951 and in March 1952. Overwintering eggs were not laid in the current season's growth. In further tests on control in 1952, applications of 1 gal. 18·5 per cent. dieldrin or 20 per cent. γ BHC per 100 gals. from a mechanical aerosol generator against the overwintered generation gave 90·5 and 85·7 per cent. reduction in the numbers of spittle masses in 17 days, as compared with untreated trees. Examination the day before and three days after similar treatment against the summer generation on 18th July with 1·5 gals. 18·5 per cent. dieldrin or 20 per cent. γ BHC, 2·5 gals. 11·7 per cent. BHC or 2 gals. 58·5 per cent. toxaphene per 100 gals. showed 85·38, 80·48, 87·77 and 85 per cent. reduction in the numbers of spittle masses containing living nymphs, as compared with 1 per cent. for no treatment, and similar examination of trees at another place sprayed by means of a conventional sprayer on 11th July with 1·33 U.S. pints 18·5 per cent. dieldrin, 1 lb. 25 per cent. wettable γ BHC as lindane, 2·5 lb. 10 per cent. wettable BHC or 1 U.S. quart 31 per cent. toxaphene per 100 U.S. gals. showed 97·97, 99·53, 98·06 and 84·93 per cent. reduction, as compared with 22·95 per cent. for the untreated trees, which were adjacent to those receiving toxaphene.

Fleschner (C. A.) & Ricker (D. W.). **Food Habits of Coniopterygids on Citrus in southern California.**—*J. econ. Ent.* **46** no. 3 pp. 458–461, 3 refs. Menasha, Wis., 1953.

Coniopterygids are among the most effective of the predators that attack *Paratetranychus* (*Metatetranychus*) *citri* (McG.) on *Citrus* in southern California [*cf. R.A.E.*, A **39** 236], *Parasemidalis flaviceps* Banks, *Conwentzia nigrans* Carpenter, and an undescribed species of *Coniopteryx* being common and *Malacomyza* sp. occurring occasionally. Since repeated attempts to rear Coniopterygids on the mite alone proved unsuccessful, studies on their feeding habits were begun, and the length of life and egg-production were measured for field-collected adults of the first three species confined with *Paratetranychus citri* and either water or honey, crawlers of *Aonidiella citrina* (Coq.), alone or with honey, honey alone, honeydew from *Saissetia oleae* (Bern.) or nectar from the extrafloral nectaries of castor (*Ricinus communis*). The life of the adults of *Parasemidalis* was short and egg-production poor on a diet of mites or Coccids, but increased considerably on one of honey, nectar or honeydew and reached a maximum on either mites or scales with honey. In general, adults of *Conwentzia* and *Coniopteryx* responded in the same manner, and the results were particularly striking when records of egg-production for the first three days after capture, which would be affected by the field diet, were ignored. Other foods containing natural sugar that were readily accepted were the nectar from orange and avocado blossoms and the honeydew from various Aphids, *Planococcus citri* (Risso) and *Pseudococcus adonidum* (L.).

In tests with larvae of the same species reared from eggs laid in the insectary, those restricted to a diet of *Paratetranychus citri* all died before reaching the pupal stage, whereas those restricted to *A. citrina* fed readily on the immature stages and gave rise to adults. Eggs of *Gnorimoschema operculella* (Zell.) were also a satisfactory food. In the field, the larvae were observed to feed on the eggs and small larvae of various species of insects, on many species of plant-feeding mites, on various Coccids and on honeydew and plant nectar.

The evidence thus indicates that Coniopterygids may not be primarily predators of mites, that they are general feeders, and that populations may be high in *Citrus* groves in which *P. citri* is uncommon and low in

others in which the mite is numerous but honeydew-secreting insects rare. When non-insecticidal acaricides were used against *P. citri* in groves in which Coniopterygids were the principal predators, the mite was eliminated, but low populations of Coccids and honeydew-secreting insects were not affected and furnished food for the Coniopterygids, which subsequently prevented an injurious mite infestation, whereas when acaricides that also eliminated insects were used, the Coniopterygids failed to become re-established, even though the mite became so abundant as to require a second treatment. Population studies have shown that Coniopterygids are most effective in controlling the mite in untreated groves in which all pests are under satisfactory biological control, such varied prey populations furnishing the complete diet required.

Franklin (W. W.). **Insecticidal Control Plot Tests for Pea Aphids in Relation to Alfalfa Hay Yields.**—*J. econ. Ent.* **46** no. 3 pp. 462–467. Menasha, Wis., 1953.

A serious outbreak of *Macrosiphum pisum* (Harris) (*pisi* (Kalt.)) occurred on lucerne in Kansas in 1952 as the plants were emerging from winter dormancy; temperatures were suitable for reproduction of the Aphid, but too low to permit the development of the Coccinellids (chiefly *Hippodamia convergens* (Guér.)) that are its chief natural enemies, and as a result, much wilting of new growth was caused. Sprays were applied on 28th April, and the numbers of Aphids were recorded by sweeping with a net before treatment and eight times from the first to the 21st day after treatment. EPN [ethyl p-nitrophenyl thionobenzenephosphonate] was used as a wettable powder, and the other materials, which included endrin and isodrin [*cf. R.A.E.*, A **41** 268, note], as emulsion concentrates. Comparison with populations on untreated plots showed that parathion, endrin and Metacide [a mixture of methyl-parathion and a smaller amount of parathion] at 4 oz. per acre, EPN at 8 oz. and Systox [O,O-diethyl O-2-(ethylmercapto)ethyl thiophosphate (demeton)] at 16 oz. caused 90 per cent. or more reduction in population 1–17 days after treatment and 33–78 per cent. on the 21st day, and DDT at 2 lb. per acre 67 per cent. on the first and 91–97 per cent. on the 3rd–21st days. The average control percentages for these materials throughout the period were 98, 95, 98, 97, 97 and 90, respectively. The corresponding percentages for the other materials tested were 61 for p,p′methoxy-DDT (methoxychlor) at 32 oz., 54 for isodrin at 4 oz. and 30–40 for aldrin at 8 oz., dieldrin at 6 oz. and chlordane and Sulphenone [p-chlorophenyl phenyl sulphone] at 16 oz. per acre.

Plants on which the Aphid was not controlled were severely affected, particularly in height. Of the sprayed plants, those treated with parathion, EPN, endrin, DDT and Systox were 47, 33, 25, 23 and 22 per cent. taller eight days after treatment than the untreated plants, those treated with Metacide and methoxy-DDT 19 per cent. taller, and only those treated with Sulphenone shorter. Hay yields were 152, 143 and 128 per cent. greater in plots treated with Metacide, parathion and Systox than in untreated plots, and 120, 119 and 96 per cent. greater in those treated with EPN, DDT and endrin. Other materials caused much less increase, and Sulphenone decreased the yield.

Rings (R. W.) & Layne jr. (G. W.). **Radioisotopes as Tracers in Plum Curculio Behavior Studies.**—*J. econ. Ent.* **46** no. 3 pp. 473–477, 5 refs. Menasha, Wis., 1953.

The authors discuss techniques developed in the course of investigations in Ohio in 1951–52 on the use of radioactive materials for studying the

movements of *Conotrachelus nenuphar* (Hbst.). Radioactive phosphorus (P^{32}) proved unsuitable for determining the specific sites chosen by the weevils for hibernation because of its short effective life, but suitable for investigations on dispersal, and experiments were then made to find other radioisotopes that could be used to distinguish different points of release in dispersal studies.

A spectrographic analysis of adult weevils showed that they contained relatively large amounts of phosphorus, sodium, calcium, potassium and magnesium, of which phosphorus is the only one having a radioisotope with practical radiation characteristics, and some aluminium, manganese, copper, iron, silicon and strontium, of which strontium is the only one having a radioisotope (Sr^{89}) that is readily available, has a sufficiently long half-life and possesses strong radiation characteristics. In preliminary tests with other available radioisotopes, excellent results were obtained with cobalt (Co^{60}) and iodine (I^{131}) and good results with zinc (Zn^{65}) and calcium (Ca^{45}), and the first three of these and radioactive phosphorus and strontium were therefore used in spring dispersal studies in 1952, and Co^{60} in hibernation studies in 1951–52. The physical characteristics of the five radioisotopes used are shown in a table.

Attempts at topical application of P^{32} by immersing the weevils in aqueous solutions of orthophosphoric acid or by applying solutions to the dorsal surface of the abdomen beneath the elytra were unsuccessful. In feeding tests, all the radioisotopes were ingested by the insects in late summer and autumn from moist cotton-wool used as stoppers to vials containing radioactive solutions, and P^{32} and Sr^{89} from succulent peach terminals immersed in solutions of radioactive orthophosphoric acid and strontium chloride in spring. Attempts to produce radioactive foliage with Co^{60} in cobalt chloride and I^{131} were unsuccessful, and Zn^{65} in zinc chloride was only moderately effective. The optimum concentrations of P^{32} and Sr^{89} in microcuries per millilitre were 50 and 2, respectively, in vials and 100 and 20 when foliage was used, and Co^{60} and I^{131} gave effective activation at concentrations of about 22–100 and 32–75 μc. per ml. in vials; these concentrations gave activities of several thousand counts per minute after exposure periods of about five days. Zn^{65} was much less effective; a concentration of 290μc. per ml. killed the weevils, and 44 μc. killed succulent peach foliage very rapidly, but a concentration of 22 μc. per ml. resulted in an average activity of 758 c.p.m. in insects feeding on peach foliage.

In the spring dispersal studies, weevils that had ingested the five isotopes were released five times at weekly intervals from 12th May until 15th June at the bases of five trees in a border row in an orchard in the early morning or after sunset, and all the trees in the orchard were subsequently jarred at intervals of about 3–4 days. The weevils collected from release trees and showing radioactivity were recorded and released again and those recovered after they had flown at least 25 ft. from the points of liberation were tested for radioactivity in the laboratory, and if radioactive, killed and further tested so as to identify the radioisotope present by means of its radiation characteristics and so ascertain the point of release. Of the 62, 127, 23, 175 and 86 weevils marked with P^{32}, Co^{60}, Zn^{65}, Sr^{89} and I^{131}, respectively, that were released, 48, 50, 5, 75 and 17 were recovered, and release points were determined for 93 per cent. of them. None treated with Zn^{65} or I^{131} was identified on other than a release tree, probably because of the short half-life of I^{131} and the small number of weevils treated with Zn^{65}, but 31 of those treated with the other materials were captured at average distances of 40, 118 and 113 ft., respectively. The shortest flight distances were associated with the shortest half-lives, but the relation was not significant, owing to the small numbers of insects used.

In the hibernation study, weevils that ingested Co^{60} at a concentration of 22μc. per ml. for 13 days and showed radioactivities averaging 9,410 c.p.m. were released uniformly throughout a peach orchard at the rate of four per tree on 26th September. Radioactive individuals could easily be detected with a portable survey meter a week later, but not in the following spring, when the radioactivity was so low that it had no effect more than an inch away. Jarring the trees periodically during the period of spring-brood activity yielded 1,260 weevils, of which 59 were found in the laboratory to be radioactive. Activity in recovered insects ranged from 52 to 1,247 c.p.m., averaging 300–400 in April and May and 140 on 11th June. All were caged and observed until death, and no chemical or radiation effects were evident; some survived until 8th July. Co^{60} did not retain radiation of sufficient intensity after several months for exact hibernation sites to be determined, but there were indications that most of the insects overwintered within the orchard.

Smith (O. J.) & Langston (R. L.). **Continuous Laboratory Propagation of Western Grape Leaf Skeletonizer and Parasites by Prevention of Diapause.**—*J. econ. Ent.* **46** no. 3 pp. 477–484, 15 refs. Menasha, Wis., 1953.

Surveys in the United States and Mexico in 1950–51 resulted in the discovery of ten species of parasites native or adaptable to the Zygaenid, *Harrisina brillians* B. & McD., which skeletonises the leaves of grape in California, and investigations showed that six of them merited propagation for field release. *H. brillians* has two complete generations a year and sometimes a partial third in southern California, and the pupae spend six months in diapause during the autumn, winter and early spring [*cf. R.A.E.*, A **34** 112, etc.]. In preparation for biological studies and propagation throughout the year, the factors responsible for the beginning and ending of the diapause in *H. brillians* and the relation to it of two of the parasites, *Sturmia harrisinae* Coq. and an undescribed species of *Apanteles* referred to as *Apanteles* sp. A, were investigated.

When larvae of *H. brillians* were reared in the laboratory on vines in pots, the pupae entered diapause when the hours of darkness exceeded 10·5 per day whether in autumn, winter or spring, whereas there was no diapause when they were reared under conditions of 15 hours per day natural or simulated daylight, even at as low an intensity as 5 foot-candles a day [*cf.* **39** 441]. Field counts made over two years showed that 99 per cent. of the larvae developing from the last week of August onward, after hours of darkness increase to 10·5 hours or more a day, gave rise to pupae that entered diapause. It appeared that the photoperiodic stimulus might exert its effect on any larval instar and that a certain number of hours of darkness might be a factor inducing diapause. It was also observed that the intensity of the diapause-inducing reaction was not uniform, leading to staggered emergence under identical environmental conditions. Moreover, there were indications of the existence of a strain, never exceeding 15 per cent. of the population and generally not evident, that entered diapause in spite of exposure to 15 hours light a day. There was no evidence that leaf moisture or either high or low temperature influenced the induction of diapause. A constant temperature of 50°F. arrested development of all stages; eggs developed normally when restored to laboratory temperature even after 120 hours, hatching being proportionally delayed; larvae in the third and fourth instars survived one week of exposure, and gave rise to pupae that did not enter diapause; prepupae died during five weeks' exposure, but pupae survived and transformed normally. The effect of gradual lowering of temperature during the larval feeding period was not ascertained.

Apanteles sp. A overwinters as a full-fed larva in its cocoon within the host cocoon, whereas *Sturmia* does so as a first-instar larva within the host pupa. Emergence records of field-collected material indicated that the parasites may enter a true diapause, with a definite period before morphogenesis is resumed, but continuous generations of both were reared when development of the host was not interrupted.

In attempts to shorten the diapause, full-fed larvae of *H. brillians* were collected in Mexico, Arizona or California in late summer. They pupated about 1st October, and the pupae were subjected to varying periods and intensity of cold, different moisture conditions, fumigation with xylol or mutilation by puncturing with a fine needle or by singeing, but no treatment shortened the diapause. Diapause had a minimum duration of 120 days, and favourable humidity, though it resulted in more uniform emergence, was ineffective until after this interval. These results indicate, however, that adults might emerge in the field after four instead of six months in favourable circumstances. *Apanteles* cocoons required 35–50 or more days at laboratory temperature to induce emergence during the winter, and *Sturmia* 30 days decreasing to 12 in early March. Only 17·7 per cent. of the pupae of *H. brillians* survived diapause in complete absence of contact moisture, mortality increased with the time for which they were kept at high temperatures before receiving contact moisture, and high mortality was associated with high evaporation, since survival was much higher at low temperatures, in spite of extended aridity. Observations on pupae kept for some months at altitudes of 8,500 or 6,000 ft. showed that within certain limits, cold during diapause did not impair survival, that little contact moisture was required at low temperatures, and that if this is adequate, additional moisture during the period of spring emergence may have a deleterious effect.

It is concluded that *H. brillians* is well adapted to the climate of southern California and might develop even more successfully to the north of its present area of distribution. Very dry periods markedly reduce its numbers during warm weather in winter, but are not injurious in summer. The greatest survival may be expected after a season in which rain falls in autumn; winter rainfall is sufficient for survival even in dry years.

Apanteles was more sensitive to moisture deficiency during diapause than its host. It readily withstood temperatures below 32°F. for three weeks, and uniform emergence was correlated with contact moisture during diapause. It is therefore concluded that *Apanteles* would probably be able to adapt itself to almost any conditions suitable for its host, although it might be less effective in extremely arid areas. *Sturmia* also survived when subjected to extremes of aridity and cold. Like *Apanteles*, it is well suited to the desert conditions of Arizona and would probably adapt itself to the climate of southern California.

Malcolm (D. R.). **Host Relationship Studies of *Lygus* in south central Washington.**—*J. econ. Ent.* **46** no. 3 pp. 485–488, 5 refs. Menasha, Wis., 1953.

Since different species of *Lygus* cause different degrees of damage to lucerne and other leguminous crops, which are grown for seed in large areas of Washington, investigations were undertaken in 1950–51 to determine the preferences of these Mirids for different varieties of lucerne, the species present in fields of seed lucerne and the populations on various plants in lucerne-growing areas of south-central Washington. *Lygus elisus* Van D., *L. hesperus* Knight, *L. desertus* Knight, *L. nigrosignatus* Knight, and one example of *L. oblineatus* (Say) were found on lucerne, but only the first

three appeared to be of importance on seed crops. These were present in the rates of about 34 : 10 : 13, when all fields were considered throughout the season, but the proportion of *L. desertus* was much higher in a field in which no control measures were taken. The Mirids appeared to have at least three complete generations and perhaps a partial fourth in the year. Substantial populations of nymphs and adults of one or more of the three species were found on several common weeds, of which the most important were *Salsola kali*, *Bassia hyssopifolia*, *Erigeron canadensis*, *Urtica holosericea* and *Melilotus* spp. Breeding was extensive on lucerne, grown as an orchard cover crop or for hay, on mint, and also on beans, potatoes and beet. Of the 16 varieties of lucerne investigated, three showed very high populations of *Lygus* and three fairly low ones.

Michelbacher (A. E.), Middlekauff (W. W.) & Bacon (O. G.). **Cucumber Beetles attacking Melons in northern California.**—*J. econ. Ent.* **46** no. 3 pp. 489–494, 10 figs., 3 refs. Menasha, Wis., 1953.

Diabrotica undecimpunctata Mannh. and *Acalymma trivittata* (Mannh.) are serious pests of melons in northern California. The adults feed on the foliage and scar the fruits, stems and crowns, and the larvae feed on the roots or scar the fruits by feeding on any part in contact with the soil. Serious infestation results from breeding within melon fields and migration from other crops that are being or have been harvested, and heavy migrations of *D. undecimpunctata* occur in spring from uncultivated regions, where the first spring generation usually develops. Honeydew melons are among the preferred food-plants and are more subject to serious injury than most other varieties.

Control measures should be applied as soon as adults become noticeable. Materials such as DDT are very effective, but sometimes cause an increase in population of mites or the melon Aphid [*Aphis gossypii* Glov.] and should therefore be applied as seldom and at as low a dosage as practicable. As little as 1 lb. actual DDT per acre is sufficient and also controls other melon pests. It can be applied as a 3 per cent. dust with 50 per cent. sulphur on honeydew melons and with 3 per cent. Aramite [2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite] or 7·5 per cent. Ovotran [p-chlorophenyl p-chlorobenzenesulphonate] on other varieties if severe infestation by mites is expected. If DDT is applied as a spray, at least 1 lb. Aramite per acre should be added to prevent an increase of mites. A 2 per cent. parathion dust applied at 30 lb. per acre is also effective, and single applications have given control for up to three weeks. Promising results were obtained with a 1 per cent. tetraethyl-pyrophosphate dust at 30 lb. per acre and a 5 per cent. malathon dust at 25 lb. per acre, and dieldrin at 0·5 lb. and aldrin and heptachlor at 1 lb. per acre have given excellent control, but have so far not been recommended for use on melons. During the early stages of growth, a 40–50 per cent. cryolite dust can be applied against the beetles, in order to avoid the adverse effects of too much DDT, but if thrips are abundant or infestation by *Empoasca abrupta* DeL. threatening, young plants should be lightly but evenly dusted with 3 per cent. DDT.

Hamilton (D. W.) & Summerland (S. A.). **Distribution and Control of Forbes Scale in the Midwest.**—*J. econ. Ent.* **46** no. 3 pp. 494–498, 8 refs. Menasha, Wis., 1953.

After about 1946, the relative abundance of different species of Coccids in orchards in the Middle West of the United States began to change, and

by 1948, infestations of *Quadraspidiotus* (*Aspidiotus*) *forbesi* (Johnson) were increasing and those of *Q.* (*A.*) *perniciosus* (Comst.) and *Lepidosaphes ulmi* (L.) decreasing. A survey of parts of Indiana, Illinois, Kentucky and Tennessee in early 1951 showed that *Q. forbesi* was the predominant species in apple, plum and cherry orchards and present in one of the 33 peach orchards inspected, though *Q. perniciosus* predominated in these. The rapid increase of *Q. forbesi* is attributed to the toxic effect of DDT and other chlorinated hydrocarbons on the natural enemies that formerly controlled it, and to a succession of mild winters, and the decrease of *Q. perniciosus* to its control by DDT [*cf. R.A.E.*, A **39** 23].

Various spray schedules were tested against *Q. forbesi* in a heavily infested apple orchard in 1951–52. In 1951, parathion at 0·5–1 lb. 15 per cent. wettable powder and Metacide [6·2 per cent. parathion, 24·5 per cent. methyl-parathion and 2·7 per cent. related organic phosphates] at 0·5 U.S. pint per 100 U.S. gals., applied three times during the periods in which crawlers were active, reduced the percentage of fruits infested from nearly 50 for no treatment to 2·3–0·8 and 0·7, respectively, and gave the best results. EPN [ethyl p-nitrophenyl thionobenzenephosphonate] reduced infestation but did not maintain satisfactory control, and endrin [*cf.* **41** 268, note] had little if any effect. In 1952, parathion and Metacide gave similar results; four applications of 0·5–1 lb. 15 per cent. parathion per 100 U.S. gals., on 5th and 27th June, 30th July and 26th August or two of 1·5 lb. on the first two dates proved more effective than two of 1·5 lb. on the last two dates. Four applications of 1 U.S. pint 50 per cent. malathon per 100 gals. compared favourably with a similar schedule of parathion, but four of 1 pint 25 per cent. emulsible diethoxyphosphinothioyl ethyl ethylphosphonate per 100 gals. were less effective and two early summer sprays of 0·25 pint Systox containing 48 per cent. active ingredient [O,O-diethyl O-2-(ethylmercapto)ethyl thiophosphate (demeton)] failed to reduce the population substantially. Dormant sprays of oils in both years or dinoseb (triethanolamine) in 1951 reduced infestation but did not give complete control. A paraffinic oil with a viscosity of about 150 secs. Saybolt was more effective than a lighter oil of this type or a naphthenic oil.

In limited tests in another orchard in 1952, eight applications of 3 lb. 25 per cent. wettable Dilan [a 1 : 2 mixture of 1,1-bis(p-chlorophenyl)-2-nitropropane and 1,1-bis(p-chlorophenyl)-2-nitrobutane] on tobacco stems, 1·5 lb. 25 per cent. Dilan with 3 per cent. wettable parathion or 1·5 lb. 15 per cent. wettable parathion per 100 U.S. gals. reduced the percentages of apples infested to 0·5, 0·1 and 0·05, respectively, as compared with 22·1 for no treatment, whereas eight of 2 lb. 50 per cent. wettable DDT gave no control.

Tuft (T. O.) & Anderson (L. D.). **Acaricides for Control of Tomato Russet Mite in California.**—*J. econ. Ent.* **46** no. 3 pp. 502–504, 6 refs. Menasha, Wis., 1953.

Vasates lycopersici (Massee) (*destructor* (Keif.)) has been a pest of tomato in California for about ten years [*cf. R.A.E.*, A **32** 199], but has been effectively controlled by dusting with sulphur. In tests in the winter of 1951–52, 23 of the newer organic materials, including endrin and isodrin [*cf.* **41** 268, note], were applied at various concentrations to young artificially infested tomato plants in a vacuum-type dusting tower [*cf.* **37** 471; **40** 100] consisting of a 12-in. bell jar in which weighed amounts of dust were released. Complete control for more than 25 days was given by 5 per cent. p-chlorophenyl p-chlorobenzenesulphonate or toxaphene, 10 per cent. R-242 [p-chlorophenyl phenyl sulphone], 0·5 per cent. endrin, parathion

or Metacide [methyl-parathion with a smaller amount of parathion] and 49 per cent. sulphur at a dosage of 0·1 gm., 2·5 per cent. DDT, 1 per cent. dieldrin or isodrin or 5 per cent. malathon at 0·25 gm. and 1 per cent. aldrin or heptachlor, 0·5 per cent. isodrin, 2·5 per cent. chlordane or malathon or 5 per cent. R-242 at 0·5 gm. Dusts containing Aramite [2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite], Compound CS-708 [a 1:2 mixture of 1,1-bis(p-chlorophenyl)-2-nitropropane and 1,1-bis (p-chlorophenyl)-2-nitrobutane], DMC [1,1-bis(p-chlorophenyl)ethanol], γ BHC as lindane, p,p′methoxy-DDT (methoxychlor), bis(p-chlorophenyl) ethynyl carbinol (MR-30), DDD (TDE) or ethyl-DDD (Q-137 [2,2-bis(p-ethyl-phenyl)-1,1-dichloroethane]) gave little or no control at any dosage. In further tests, Systox [O,O-diethyl O-2-(ethylmercapto)ethyl thiophosphate] and schradan at a concentration of 0·001 gm. per litre gave perfect control of the mite throughout the experiment when applied by irrigation at the rate of 10 cc. per plant.

Jordan (C. R.). **A Strepsipteran Parasite of the Three-cornered Alfalfa Hopper.**—*J. econ. Ent.* **46** no. 3 p. 505, 1 ref. Menasha, Wis., 1953.

Strepsiptera found parasitising *Spissistilus* (*Stictocephala*) *festinus* (Say) in Texas and Louisiana in the spring and summer of 1950 were described by W. D. Pierce (1952) as *Membracixenos jordani*, gen. et sp. n. Examination of over 1,000 examples of the Membracid collected by sweeping lucerne and soy beans in July and August 1950 showed the presence of parasites externally on 14·13 per cent.; the percentage parasitism would have been much higher had parasites developing internally been recorded. Up to four parasites were found protruding between the abdominal sclerites of individual hosts, and as many as six were dissected per individual. Parasitism was much lower in 1951, when only 15 of 4,336 examples of the Membracid examined over a period of five months were parasitised. The parasite was not shown to kill its hosts, but no eggs were found in parasitised females, and it is considered that the high rate of parasitism was a contributing factor in keeping populations of *S. festinus* relatively low in 1950.

Watters (F. L.) & Smallman (B. N.). **DDT, Methoxychlor, and Pyrethrins-Piperonyl Butoxide against the Hairy Spider Beetle in Warehouses.**—*J. econ. Ent.* **46** no. 3 pp. 505–506, 3 refs. Menasha, Wis., 1953.

In an attempt to find materials of low mammalian toxicity for the control of *Ptinus villiger* Rttr. in flour and cereal warehouses in Manitoba [*cf. R.A.E.*, A **38** 55], 2·5 per cent. technical DDT in deodorised kerosene was compared with a formulation containing 10 gm. piperonyl butoxide and 1 gm. pyrethrins per 100 ml. base oil, diluted with deodorised kerosene to give 2·5 per cent. piperonyl butoxide, in 1949, and 2·5 per cent. DDT with 2·5 per cent. p,p′methoxy-DDT (methoxychlor), as wettable powders, in 1950. All sprays were applied to the floor and lower 5 ft. of walls to give deposits of about 100 mg. DDT, methoxy-DDT or piperonyl butoxide per sq. ft. of surface. DDT and the piperonyl-butoxide mixture reduced the mean numbers of Ptinids obtained from three 7-lb. sacks of flour from 199·8 to 10·4 and 44·1 respectively, when applied in April and from 443·6 to 6·4 and 14·3 when applied in both April and June 1949, and DDT and methoxy-DDT reduced them from 245·8 to 32·3 and 117·9, respectively, when applied in April 1950. Statistical analysis of the results showed that two applications of DDT were no more effective than one, that two applications of piperonyl butoxide and pyrethrins were significantly better

than one and about as effective as one of DDT and that a single application of DDT was better than a single application of the piperonyl-butoxide mixture or methoxy-DDT.

Chandler (S. C.). **Timing Plum Curculio Sprays on Apple.**—*J. econ. Ent.* **46** no. 3 pp. 506–509, 5 graphs. Menasha, Wis., 1953.

Spraying for the control of *Conotrachelus nenuphar* (Hbst.) on apple in Illinois is usually begun at the calyx stage, when at least 75 per cent. of the petals have fallen, but population records throughout the seasons of 1951 and 1952 showed that the adult weevils first appeared at the pink or the early bloom stage, depending somewhat on the variety of apple, were most abundant during the flowering period, decreased rapidly within a week after petal-fall and were comparatively rare during the rest of the first-brood period. In 1952, the first adults were found on peach at full bloom, which corresponded to the pink or pre-pink stage on all but one very early variety of apple, and it is concluded that these are the normal stages at which the weevil should be expected on most apple varieties. Feeding and oviposition punctures were first observed soon after petal-fall and increased for at least two weeks after it, despite spraying.

In tests with parathion, chlordane, and dieldrin alone or with lead arsenate in widely separated orchards in southern and western Illinois, there were 3–10·3 times as many punctured apples and 3·7–5·2 times as many adults were jarred from the trees in plots receiving 2–3 applications beginning at the calyx stage as in those receiving 3–4 applications beginning at the pink stage.

Eden (W. G.). **Effect of Fertilizer on Rice Weevil Damage to Corn at Harvest.**—*J. econ. Ent.* **46** no. 3 pp. 509–510, 9 refs. Menasha, Wis., 1953.

Observations were made in Alabama in 1949–52 to ascertain whether fertilisers applied to maize affected the degree of damage by *Calandra* (*Sitophilus*) *oryzae* (L.) to the kernels at harvest. In 1949, treatments with nitrogenous fertiliser affording 50–200 lb. nitrogen per acre caused no significant difference in weevil damage as determined by Frankenfeld's method [*cf. R.A.E.*, A **41** 178], but treatment with 48–120 lb. per acre resulted in a significant correlation between rate of nitrogen and weevil damage, the average percentage of injured grains increasing from 47·9 to 78·7 as the dosage of nitrogen increased. In 1950 and 1952, treatment with 30–120 lb. nitrogen per acre had no effect on weevil damage. No significant differences in infestation resulted from treatments with phosphate or potash fertilisers.

Medler (J. T.) & Fisher (E. H.). **Leafhopper Control with Methoxychlor and Parathion to increase Alfalfa Hay Production.**—*J. econ. Ent.* **46** no. 3 pp. 511–513. Menasha, Wis., 1953.

In demonstration tests of insect control on second-growth lucerne in Wisconsin in 1952, when populations of *Empoasca fabae* (Harr.) were high, plots were sprayed with an emulsion giving 1 lb. technical methoxy-DDT (methoxychlor) or with 4 oz. technical parathion in about 10 U.S. gals. per acre, with low-volume sprayers. Counts of *E. fabae* and combined counts of the Mirids, *Adelphocoris lineolatus* (Goeze), *A. rapidus* (Say) and *Lygus oblineatus* (Say), were made by sweeping two weeks later. The results

showed that both compounds were consistently effective against *Empoasca*, whereas parathion gave fair control of the Mirid nymphs but none of the adults, and methoxy-DDT no control of either. Adults of *Empoasca* were numerous in fields that contained only stubble at the time of spraying, but they were probably migrants, and the results supported the observation that a count of nymphs on lucerne gives a good measure of insecticide efficiency. In untreated plots, yellowing due to *Empoasca* was severe, moderate and slight, after early, middle and late first cuttings, respectively, and populations of the Jassid were progressively smaller. In treated plots, the lucerne was uniformly green and the yields 38–300 per cent. higher than in the untreated ones. This increase is considered to be largely a result of controlling *Empoasca*, though the higher production generally shown in the parathion plots may have been due to Mirid control. The hay was of better quality in treated than in untreated plots after early and middle first cuttings, but not after late cutting. Maximum protection is apparently not given by one application of methoxy-DDT or parathion, as these insecticides have too little persistent effect.

Wene (G. P.) & Blanchard (R. A.). **Sponging Method of Earworm Control in Texas.**—*J. econ. Ent.* **46** no. 3 pp. 515–516, 1 fig., 2 refs. Menasha, Wis., 1953.

The following is based on the authors' introduction and summary. Since sweet maize in the Lower Rio Grande Valley of Texas is irrigated three times at weekly intervals, beginning when about 5 per cent. of the ears are in silk, and boom sprayers cannot be used in the fields for 4–6 days after each irrigation, the sprays recommended against *Heliothis armigera* (Hb.) cannot be properly timed. In tests in 1952, good control was obtained by dipping a small synthetic rubber sponge in a solution of 0·5 per cent. DDT in mineral oil and then pressing the sponge on the silk mass of each ear until about 1 ml. ran into the silk. It was found that a single treatment applied at one time to all ears in the field is best made nine days after silking begins; if it is applied earlier, the oil injures the ear tip and prevents kernel development, and if it is applied later, control is reduced.

Excellent control of *Heliothis* was obtained and damage to the ears by the oil kept at a minimum by making two trips through the field. The first should be made 5–6 days after silking begins, and the second 4–5 days later. Only ears with wilted, light brown silks should be treated, and only one treatment per ear is necessary. The operator should wear rubber gloves to protect the hands, and the plant remains should not be fed to dairy cattle or animals for slaughter.

Polivka (J. B.). **Residual Effectiveness of some organic Insecticides in Control of Japanese Beetle Larvae.**—*J. econ. Ent.* **46** no. 3 pp. 517–519, 3 refs. Menasha, Wis., 1953.

The results are given of observations in Ohio in 1946–52 on the persistence in the soil of BHC, toxaphene, p,p′methoxy-DDT (methoxychlor) and parathion applied at various rates against larvae of the Japanese beetle [*Popillia japonica* Newm.]. In a test in which BHC was applied in September 1946, 0·25 lb. γ isomer per acre was ineffective, 2·5 and 5 lb. caused significant reductions in population for six but not seven generations, and 10 lb. reduced the population significantly in five weeks and remained effective throughout seven generations. In plots treated in October 1947 and sampled during May in 1948, 1949, 1951 and 1952, toxaphene at 25–75 lb. per acre gave complete control and BHC at 2·5 lb. γ isomer per acre was

very effective throughout the period. BHC at 0·25 lb. γ isomer and p,p'methoxy-DDT at 25–75 lb. caused significant reductions in each year except 1949, but the control afforded was not considered adequate. Parathion at 5–20 lb. per acre was very effective against larvae in the soil at the time of application, but appeared to lose its effect after 3–4 generations. In plots treated in April 1948, toxaphene at 5–25 lb., parathion at 1–25 lb. and BHC at 0·25–12 lb. γ isomer per acre all caused significant reductions in population in October 1948, and toxaphene at all rates and γ BHC at 12 lb. were still effective in October 1951. Parathion applied to turf at 1–5 lb. per acre in April 1949 caused significant reductions in populations in September 1949 and in October in 1950, 1951 and 1952.

Borden (A. D.), Lange (W. H.) & Madsen (H. F.). **A Spotted Tentiform Leaf Miner Outbreak in California Orchards.**—*J. econ. Ent.* **46** no. 3 p. 519, 1 fig. Menasha, Wis., 1953.

A severe outbreak of a leaf-miner tentatively identified as *Lithocolletis crataegella* Clem. [*cf. R.A.E.*, A **40** 97] occurred in 1952 on apple, peach and cherry in northern California, where this Gracillariid has been of minor importance for many years. In heavily infested orchards, apple and pear leaves were severely injured by early August, but damage to neighbouring quince, plum and peach was of minor importance; no mines were found in fruits, though eggs were occasionally deposited on them. Mortality of the larvae was high. In one heavily infested pear orchard in the Sierra foothills, 11 per cent. had been killed by parasites by 12th August and 55 per cent. by parasites and 43 per cent. by other agencies, possibly predators, by 20th November. *Zagrammosoma mirum* Gir. and an unidentified species of *Sympiesis* were the most numerous parasites reared; both are primary, external parasites of the older larvae.

Questel (D. D.) & Brindley (T. A.). **Small-plot Tests of new Insecticides in Control of European Corn Borer, 1950–1951.**—*J. econ. Ent.* **46** no. 3 pp. 519–521, 3 refs. Menasha, Wis., 1953.

Various new insecticides that had shown promise in the laboratory were compared with DDT against *Pyrausta nubilalis* (Hb.) on maize in small field plots in Iowa in 1950–51. They were applied to the whorls of the plants in sprays at approximately 120 U.S. gals. per acre, and the results were estimated from plants dissected in late July, at about the time of pupation. Applications were made on 30th June, when the plants were 50 ins. high and showed shot-hole injury, and 7th July in 1950, and on 29th June, when they were 49 ins. high and hatching had begun 12 days previously, and 9th July, when hatching was complete, in 1951.

All materials caused significant reductions in borer numbers as compared with no treatment. Excellent results were given in both years by EPN [ethyl p-nitrophenyl thionobenzenephosphonate], applied at 0·5–1 lb., Dilan [a 1:2 mixture of 1,1-bis(p-chlorophenyl)-2-nitropropane and 1,1-bis (p-chlorophenyl)-2-nitrobutane] at 0·8–1 lb., heptachlor at 1 lb. and γ BHC as lindane at 0·75–1 lb. actual compound per 100 U.S. gals., all in wettable powders, and these materials are considered to show considerable promise. Dilan in emulsion sprays and sulphoxide [isosafrole n-octyl sulphoxide (*cf. R.A.E.*, A **41** 20)], alone or with ryania, and rotenone with n-propyl isome [a condensation product of isosafrole and n-propyl maleate] in wettable powders destroyed some leaf tissue in the whorls and malathon, ethyl-DDD (Q-137 [2,2-bis(p-ethylphenyl)-1,1-dichloroethane]), dieldrin and Dilan in

wettable powders discoloured it in 1950. In 1951, pentachlorophenol, endrin and isodrin [*cf.* **41** 268, note] in emulsion sprays caused severe injury and parathion in a wettable powder some injury in the whorl, and malathon, heptachlor, endrin and allethrin in wettable powders, p,p'methoxy-DDT (methoxychlor) in an emulsion and ryania with n-propyl isome and a wetting agent slight yellowing of some leaves in the whorl. Metacide [6·2 per cent. parathion, 24·5 per cent. methyl-parathion and 2·7 per cent. related organic phosphates] in an emulsion caused severe stunting.

Bartlett (B. R.). **A tactile ovipositional Stimulus to culture** *Macrocentrus ancylivorus* **on an unnatural Host.**—*J. econ. Ent.* **46** no. 3 p. 525, 1 ref. Menasha, Wis., 1953.

As females of the Braconid, *Macrocentrus ancylivorus* Rohw., were observed to ignore larvae of *Gnorimoschema operculella* (Zell.) that were outside the burrows that they make in potato tubers, but probed with the ovipositor through frass piles covering empty burrows, it appeared that the primary stimulus for oviposition was a tactile response to certain textures. An attempt was made to induce parasitism of *Plodia interpunctella* (Hb.) by means of this reaction to frass piles. When a medium consisting of wheat middlings, bran, water and honey (12 : 8 : 10 : 10) with 0·1 part of a commercial mould preventive, which combined the requirements for favourable development of *P. interpunctella*, was compressed to produce a smooth surface, the larvae readily burrowed in it and formed frass piles on the surface, and females of *M. ancylivorus* oviposited in the young larvae in the burrows. Adult parasites emerged about 23 days after oviposition.

Eggs of *Plodia* were obtained by confining the adult moths in jars covered with fine-mesh screen, through which the loose eggs could be shaken. These were scattered at the rate of 20–30 per sq. in. over the surface of the medium, which was punctured with small holes to ensure uniform distribution of larval burrows. The larvae hatched in 3–4 days at a temperature of 80°F., and were attacked most readily when the parasites were closely confined to the surface of the medium.

Dowden (P. B.) & Girth (H. B.). **Use of a Virus Disease to control European Pine Sawfly.**—*J. econ. Ent.* **46** no. 3 pp. 525–526, 1 ref. Menasha, Wis., 1953.

Following successful experiments in Canada in 1950 with a European virus disease of *Neodiprion sertifer* (Geoffr.) [*cf. R.A.E.*, A **41** 22], tests of its value against that sawfly were made in New Jersey and Illinois. In New Jersey, 0·5 acre of heavily infested red pine [*Pinus resinosa*] and Scots pine [*P. sylvestris*] 6–10 ft. high was thoroughly sprayed by means of a knapsack sprayer with 60 U.S. gals. of a suspension of about 250 million polyhedra per U.S. gal. on 1st May 1951, when some 90 per cent. of the eggs had hatched, and dead larvae fell from the trees from 9th May for about a fortnight, after which mortality appeared to be complete throughout the area. Another half acre was treated at the same rate on 14th May, when the larvae were about three-quarters grown, with equally good results; larvae on trees adjacent to sprayed ones were not affected. In 1952, few larvae were observed on the sprayed trees, and a few diseased ones were found on trees up to 300 yards from them.

Large numbers of diseased larvae were collected in 1951 for the preparation of virus suspension, and in 1952, rapid application of this as a fine mist at a concentration of about 2,000 million polyhedra per U.S. gal. with

a knapsack sprayer gave 82–100 per cent. control in three small areas in Illinois. The virus was also successfully distributed by aeroplane over 18·6 acres of heavily infested red and Scots pine in New Jersey. A water suspension of about 2,500 million polyhedra per U.S. gal., with the addition of 1 pint glycerol per 3·5 gals. spray to prevent evaporation, was applied at about 2 U.S. gals. per acre on 14th May 1952 and gave complete or almost complete control.

Davis (D. W.) & Sessions (A. C.). **On the Systemic Action of Systox on Cotton.**—*J. econ. Ent.* **46** no. 3 pp. 526–527. Menasha, Wis., 1953.

In 1951, a dust of 1 per cent. O,O-diethyl O-2-(ethylmercapto)ethyl thiophosphate (Systox) proved very effective against *Tetranychus bimaculatus* Harvey and *T. pacificus* McG. on cotton in California, but there was doubt as to how much of the control was due to systemic action. Treatment with 40 lb. dust per acre gave up to 60 per cent. mortality of eggs of *T. bimaculatus*, though less of those of *T. pacificus*, and in one test there was no control of mites placed on newly developed foliage one week after treatment. In 1952, when a 21·2 per cent. emulsion concentrate was used, excellent control of mites was obtained, but again it was not known whether this was due to systemic action, and experiments were therefore carried out on cotton plants that had completed most of their seasonal growth to determine the type of action involved.

Immersing the top leaves in 10–40 cc. of the concentrate per U.S. gal. resulted in little or no kill on the lower leaves, and spraying the lower leaves while the upper ones were protected caused some mortality on the latter, but less than is often observed when the whole plant is sprayed. Mites on a plant bent over a tub containing 15 cc. of the concentrate in 2 U.S. gals. water so that they were kept at least six inches from it were all dead within 24 hours, which indicated considerable fumigant action. Applying drops of the concentrate diluted at 15 cc. per U.S. gal. to the upper surfaces of the leaves resulted within a day in complete mortality of active mites on the lower surfaces but appeared not to affect those on adjacent leaves. Applying 40 cc. in 2 U.S. gals. to the soil round the roots along 10 ft. of row and covering with soil gave practically complete control of mites on the plants in 24 hours, whereas applying it to soil in a trough buried by the side of the plants caused some kill of mites on the lower but none on the upper leaves.

It appears, therefore, that systemic action is high following absorption by the roots or dispersion within single leaves, but that there is little downward movement in the stems and petioles. The systemic effect is greatly assisted by contact and fumigant action; the latter is so great that it sometimes appears to be the major cause of mite mortality.

Milum (V. G.). *Tinea fuscipunctella* **associated with** *Tyroglyphus lintneri*. —*J. econ. Ent.* **46** no. 3 p. 527, 1 ref. Menasha, Wis., 1953.

In January 1936, a can of mouldy wheat in Illinois was found to contain numerous larvae and adults of *Tinea fuscipunctella* Haw., in addition to various other arthropods, and the presence of cocoons similar to those of the moth in a bird's nest near the can indicated a possible source of infestation [*cf. R.A.E.*, A **16** 542; **37** 164]. Many individual larvae were surrounded by masses of mites belonging to a species of *Tyrophagus* identified by Ewing as *Tyroglyphus lintneri* Osb. [*cf.* **31** 157, etc.], which appeared not to injure them.

Several attempts to establish cultures of *Tinea* in a new supply of moist clean wheat were unsuccessful until the mites were added, when the release of fertilised females resulted in the development of another complete generation. The larvae appeared unable to feed on the whole kernels, and it is possible that the mites fed on the wheat and the larvae on the excreta of the mites or other refuse.

Shelford (V. E.). **Termite Treatment with One Per Cent Solution of Chlordane.**—*J. econ. Ent.* **46** no. 3 pp. 527–528, 4 refs. Menasha, Wis., 1953.

In tests in 1952, soil near the foundations of a house in Illinois that had been treated with 1 per cent. chlordane in September 1947 for the control of termites [*R.A.E.*, A **38** 251] showed no reduction in toxicity [*cf.* **40** 353]. When nearly dry treated soil was diluted with garden soil in proportions of 3 : 3, 2 : 4 and 1 : 5, the time required for paralysis (leg movement only) was increased from 20 to 24, 48 and more than 48 hours, respectively, and it is concluded that the soil will remain toxic for several more years. Methods of maintaining the test termites and the technique of the experiments are discussed.

Smith (C. C.). **The Life-history and Galls of a Spruce Gall Midge, *Phytophaga piceae* Felt (Diptera: Cecidomyiidae).**—*Canad. Ent.* **84** no. 9 pp. 272–275, 3 figs., 2 refs. Ottawa, 1952.

In June 1948, shoots of the previous year's growth on a white spruce (*Picea glauca*) in New Brunswick were found to be distorted and killed as a result of attack by a Cecidomyiid identified as *Phytophaga piceae* Felt [*R.A.E.*, A **14** 627], all stages of which are briefly described. Similar damage was later found on a few more trees in the same Province and on white spruce and red spruce (*Picea rubra* (*rubens*)) at two places in Nova Scotia. The Cecidomyiid is probably widespread in the Maritime Provinces, but normally not sufficiently abundant to attract attention. Individual trees appear to be particularly susceptible to attack.

In 1949, adults emerged from the galls during 15th–31st May, and the females oviposited a few days later. Eggs were laid mostly at the base of the needles on the new shoots, but occasionally under the bud scales. As many as 100 larvae occurred on a single shoot. After hatching, the larvae bore into the shoot and form a cell, which may be occupied by as many as three larvae separated by membranous tissue. The galls become noticeable after about ten days. Pupation occurs in the cells early in the following May. As a result of attack, shoots of the current year curl and swell to about twice their normal diameter; the galls appear as hemispherical swellings. In the following year, most of the heavily infested shoots die, many needles fall, and the tree appears unhealthy. Injured shoots are often attacked by the fungus, *Ascochyta piniperda*. If attack is not severe, the shoots may survive and sometimes continue to grow, though severely twisted. Parasitism of the Cecidomyiid was heavy. In July 1948, Chalcidoids of the genera *Torymus* and *Amblymerus* were observed on infested shoots, and in the spring of 1949, two species of *Torymus*, one of *Tetrastichus*, and one of *Amblymerus* identical with that recorded by Clark from *Rhabdophaga swainei* Felt [**41** 58] were reared from *P. piceae*. During the summer of 1949, larval mortality from unknown causes reached about 80 per cent.

Smith (M. V.) & Townsend (G. F.). **A Method of measuring Pollinator Populations on Field Crops.**—*Canad. Ent.* **84** no. 10 pp. 314–316, 1 fig., 5 refs. Ottawa, 1952.

The apparatus described is mounted on an extensible metal shaft that supports it over a field crop in which pollinating insects are flying. When adjusted for use, an eye-piece restricts the area of crop visible to one square yard, which is outlined by a frame that can be fitted with a plastic grid to facilitate counting. By means of this apparatus, a large number of counts can be made in a relatively short time, permitting very complete coverage of a field with minimum disturbance of the insect population.

Stark (R. W.). **Analysis of a Population Sampling Method for the Lodgepole Needle Miner in Canadian Rocky Mountain Parks.**—*Canad. Ent.* **84** no. 10 pp. 316–321, 5 refs. Ottawa, 1952.

The outbreak of *Recurvaria milleri* Busck on lodgepole pine [*Pinus contorta*] in western Canada that was first reported from the Banff National Park in 1942 [*R.A.E.*, A **35** 59] later spread to the Kootenay and Yoho National Parks and at the time of writing affected practically all areas in the region where there were extensive stands of lodgepole pine. High mortality among late-instar larvae in the Banff National Park during the winter of 1949–50 reduced infestation so that there was less discoloration of the pines than in preceding years; infestation in the other two parks remained at about the same level.

The sampling method adopted for estimating the larval population is described, and the following is virtually the author's summary of it. The average number of larvae per branch tip (including five years' needles) is accepted as the infestation unit; four branch tips are taken from two crown levels in each tree, the average number per branch tip per tree being calculated for each crown level. In the population now present in Yoho National Park, to obtain results within a 10 per cent. error (computed from the standard error of the mean) 40 trees were sampled at valley bottom, 35 at the 750-ft. level, and 30 at the 1,500-ft. level. Application of the variance component technique indicated that sampling fewer trees with more branch tips or more trees with fewer tips would give comparable results. Transformation of the data was required so that analysis of variance could be applied. There is a significant difference in degree of infestation between altitude levels, between trees at valley bottom and the 750-ft. level, and between crown levels. For practical purposes the lower-crown samples could be eliminated and the measure of the outbreak taken as the average number of larvae per tip in the more vital upper crown. Fewer trees would be required for this estimate. Progress of an outbreak could be determined by yearly investigations of this type.

Jameson (H. R.) & Peacock (F. C.). **Taint in Potatoes grown on Land treated with technical γ-Benzene Hexachloride or pure γ-Benzene Hexachloride.**—*J. Sci. Fd Agric.* **4** no. 2 pp. 102–104, 2 figs., 1 ref. London, 1953.

As potatoes grown in soil treated with crude BHC have sometimes been tainted by the chemical, experiments were carried out in England in 1947–49 to determine whether the use of BHC with a high content of γ isomer would reduce the risk of this. Dusts containing 0·2–2 per cent. γ isomer were prepared from crude BHC purified to contain 56 per cent. γ isomer and from technical γ BHC (90 per cent. γ isomer) and worked into the soil at rates of 1–4 lb. γ BHC per acre in the spring of 1947, shortly before the

potatoes were planted. Taste tests of tubers lifted five months later showed that both products caused at least as much taint as had crude BHC in former tests; the technical product tainted the crop in the first season rather more than had the crude material, but decreased in tainting capacity more rapidly in the second and third seasons, though there were no consistent significant differences between the products. In 1948, similar dusts prepared from technical and highly purified γ BHC were applied at 2–16 oz. γ BHC per acre as before, and statistical analysis of the results showed no significant differences in tainting in 1948 or in 1949 between equal weights of the isomer in these two forms.

It is concluded that about 8 oz. technical or pure γ BHC per acre can be applied to loam soils just before a potato crop is planted, or 2 lb. per acre 12 months before planting, without risk of taint.

Atkins (W. G.) & Greer (E. N.). **The Storage of Flour in Jute Bags treated with Insecticides.**—*J. Sci. Fd Agric.* **4** no. 3 pp. 155–160, 2 figs., 2 refs. London, 1953.

An account is given of experiments in which flour was stored in hessian bags, the fabric of which had been impregnated during manufacture with 1, 1·25 or 1·5 per cent. DDT or 0·1 per cent. crude BHC by weight, and exposed to infestation by *Ptinus tectus* Boield., *Ephestia kuehniella* Zell. and *Tribolium confusum* Duv. Five bags representing each treatment and ten of untreated material were stored in a shed in the laboratory for nearly six months at temperatures of 72–85°F. and over 70 per cent. relative humidity, and 1,000 insects of each species were liberated 14 days after the beginning of the experiment and 3,000 of each about ten weeks later. Flour in contact with the hessian was withdrawn after 12 days and baked into bread; that from the bag treated with BHC had a mouldy flavour, and there was some indication of a bitter taste in that from DDT-treated bags.

Examination of sample bags after exposure to infestation for two and about five months showed that all DDT treatments had protected the flour from attack by *Ptinus* and *Ephestia* and given fair protection against *Tribolium*, with no significant difference between treatments; BHC caused inadequate reductions in populations of all three species. Both untreated bags and those treated with BHC were heavily webbed by *Ptinus* and *Ephestia*. *Tribolium* was concentrated mainly in the top of the bags and had evidently penetrated the treated hessian without impairment of fertility.

Analysis at the end of the experiment of samples of flour taken after the contents of each bag had been thoroughly mixed showed 13·8, 19, 23 and 4·2 parts per million insecticide from bags treated with 1, 1·25 and 1·5 per cent. DDT and 0·1 per cent. BHC, respectively, and since the recommended tolerance is 7 p.p.m. for DDT and 2·5 p.p.m. for BHC in foodstuffs, it is concluded that all the treatments tested were undesirable.

Small-scale tests indicated that penetration of a double layer of fabric was difficult, even for *Tribolium*, and it is possible that the use of double layers, with only the outer one impregnated, would limit both insect penetration and flour contamination.

Warren (G. J.). **The Influence of Piperonyl Butoxide and DDT on the Determination of the Pyrethrins Content of commercial Spray-Insecticides by the A.O.A.C. and the Seil Methods.**—*J. Sci. Fd Agric.* **4** no. 4 pp. 180–183, 1 ref. London, 1953.

The following is virtually the author's summary. The estimation of total pyrethrins either by the A.O.A.C. method of analysis [based on the

mercury reduction method of Wilcoxon as modified by Holaday (*cf. R.A.E.*, A **37** 184)] or the Seil method [*cf.* **38** 77] yields high results in the presence of the synergist piperonyl butoxide, or DDT. Both these compounds, on hydrolysis with alcoholic potassium hydroxide, produce acidic substances which, being apparently only slightly soluble in light petroleum and non-volatile in steam do not affect appreciably the estimation of pyrethrins I, but, being soluble in ether, give falsely high results for pyrethrins II by either method.

Mitchell (W.). **A new Method for Assay of the " Pyrethrins ".**—*J. Sci. Fd Agric.* **4** no. 6 pp. 278–281, 13 refs. London, 1953.

The following is the author's summary. A new method for assay of " pyrethrins " is described. It is suggested that its successful operation requires less experience than do the existing methods. Comparative results on pyrethrum flowers and extracts by the new method and the A.O.A.C. (Association of Official Agricultural Chemists) method [*cf.* preceding abstract] are given. A comment is made on the standard of accuracy to be expected from pyrethrum analyses in general.

Berry (P. A.) & Abrego (L.). **Insects and Diseases affecting some Crops in El Salvador.**—*FAO Plant Prot. Bull.* **1** no. 10 pp. 151–153. Rome, 1953.

The most injurious pest of cotton in Salvador is *Anthonomus grandis* Boh., which was shown to feed and breed throughout the year. Although it appears in any small planting, however isolated, no alternative food-plants are known. Control is hindered by rain, which falls almost daily throughout the growing season. *Heliothis armigera* (Hb.) also attacks cotton and breeds throughout the year, but in the absence of insecticidal treatment against *A. grandis*, appears to be held in check by natural enemies. When insecticides are applied against *A. grandis*, additional treatment against *H. armigera* is often necessary. *Alabama argillacea* (Hb.) is frequent on cotton, usually appearing in large numbers late in the season before the crop matures, and sometimes causes considerable damage. *Sacadodes pyralis* Dyar was recorded infesting cotton in Salvador for the first time in January 1953.

The most harmful insect pest of coffee during 1951–52 was *Idiarthron subquadratum* Sauss. & Pict. [*cf. R.A.E.*, A **20** 226]. The eggs of this Tettigoniid are laid in the soil at a depth of 1–3 ins. during August–December, remain dormant during the dry period, and hatch 10–15 days after the rains begin in the following April–May. There is one generation a year. Excellent control was obtained by applying insecticides to the soil at intervals of 8–10 days during the period when the nymphs were emerging from it. Parasites, including an undescribed Myrmarid of the genus *Platypatasson* that attacks the eggs, give considerable control. *Dysmicoccus (Pseudococcus) brevipes* (Ckll.) and another mealybug attack the roots of the plants, which are weakened and stunted, but rarely killed; damage appears to be restricted to small areas. Adults of *Epicaerus capetillensis* Sharp were abundant in one plantation and destroyed the margins of about 30 per cent. of the leaves; the eggs of this weevil are laid in small crevices in wood, and the larvae develop in the soil. Of the shade trees in coffee plantations, *Inga* is defoliated by *Hemiceras* spp. and *Gliricidia sepium* by *Hemerocampa* sp., which spins its cocoons on this tree and also on coffee, where the irritant hairs cause annoyance to the pickers.

Pests of other crops recorded comprise *Laphygma frugiperda* (S. & A.) on maize, which was severely injured during recent dry seasons when grown under irrigation or where the water table is high, *Rhynchophorus palmarum* (L.) on coconut, and *Anthonomus eugenii* Cano on peppers [*Capsicum*], losses of which amount to 75–95 per cent. Insecticides such as toxaphene and chlordane give satisfactory control, but are liable to contaminate the crop at harvest.

Olalquiaga Fauré (G.). **Pests of edible Legumes in Chile.**—*FAO Plant Prot. Bull.* **1** no. 11 pp. 166–168. Rome, 1953.

Pulse crops are important in Chile, but are being increasingly damaged by insects and other pests. Germinating bean seeds, and the seeds of many other plants, including peas, are attacked by *Hylemyia cilicrura* (Rond.) and *H. trichodactyla* (Rond.); losses can be prevented by timing sowing so as to avoid attack and by treating the seeds with DDT, BHC, toxaphene methoxy-DDT (methoxychlor) or calomel [mercurous chloride]. *Epinotia opposita* Heinr., the larvae of which feed in the green pods [*cf. R.A.E.*, A **30** 566], occurs in two main areas. If planting is delayed or oviposition unusually early, the larvae sometimes injure the stems so seriously that no crop is produced. Pupation occurs on or just below the surface of the soil. Insecticides applied as soon as the adults appear, especially in early spring and before the eggs are laid, give effective control and flooding destroyed at least 30 per cent. of the pupae. Larvae of *Rachiplusia nu* (Gn.) sometimes severely defoliate beans, and also injure the foliage, young pods and green seeds of chickpea (*Cicer arietinum*). The cocoons are formed in the rolled-up leaves of various weeds and in empty chickpea pods. Early sowing tends to prevent losses in some regions, and an insectivorous bird affords considerable control. The parasites of this moth in Chile are the Braconid, *Rogas nigriceps* Brèthes, and the Tachinid, *Incamyia chilensis* Aldr. Attempts to eradicate *Bruchus* (*Acanthoscelides*) *obtectus* Say proved unsuccessful [**35** 8], and this Bruchid is distributed in several central provinces on beans in the field. It can be controlled by insecticides applied to the ripe pods before they open, and damage can be reduced in some localities by late planting. Other insects that injure beans are *Nezara viridula* (L.), *Elasmopalpus lignosellus* (Zell.), which also infests maize and Sudan grass [*Sorghum sudanense*], the Aphids, *Trifidaphis* (*Tullgrenia*) *brevicornis* (Hart) and *T.* (*T.*) *phaseoli* (Pass.), which attack the underground parts, the weevils, *Listroderes subcinctus* Boh. and *Pantomorus taeniatulus* (Berg), the Tenebrionid, *Blapstinus punctulatus* Solier, which also injures tomatos, *Schistocerca cancellata* (Serv.), *Dichroplus* spp., and an unidentified Tetranychid. Stored beans are attacked by *Sitodrepa* (*Stegobium*) *paniceа* (L.), *Calandra* (*Sitophilus*) *granaria* (L.), *Blastobasis* sp., *Bruchus obtectus*, *B.* (*Acanthoscelides*) *obreptus* (Bridwell), and *Sericoides rufcola* (Solier), of which the last two are confined to the north and south, respectively.

The principal pest of peas is *Bruchus pisorum* (L.), which occurs throughout the pea-growing area except in the two southern provinces. In the chief district concerned, infestation sometimes reaches 85 per cent. Eggs are laid on the young pods, the larvae develop in the seeds, and the adults overwinter in the seeds or under the bark of various trees. Control is given by applying parathion, aldrin, BHC or DDT as soon as the first flowers appear. Losses can be reduced by late planting and are increased by early planting. *Thrips tabaci* Lind. causes important reductions in the yield of peas for canning; timely applications of DDT, BHC or aldrin improve both the yield and the quality of the peas, and damage can be reduced by late

sowing. Severe outbreaks of cutworms, notably *Agrotis ypsilon* (Hfn.), periodically cause serious losses; parasites, of which the Tachinids, *Archytas infirmus* (Wlk.) and *Gonia pallens* Wied. are abundant in one area, give partial control. *Dichroplus elongatus* G.-T. causes heavy losses, especially in Aranco Province, and an unidentified Agromyzid mines the leaves and pods.

Lentils are damaged by *Tipula apterogyne* Philippi, especially in Chanco; infestation is usually severe in newly ploughed soil and where wild food-plants have been growing. They are also infested by *Pseudococcus maritimus* (Ehrh.) and cutworms, some of which are controlled by *I. chilensis*, the other Tachinids, *Peleteria filipalpis* (Rond.), *Phorocera* (*Parasetigena*) *porteri* (Brèthes), *G. pallens* and *Archytas infirmus*, and the predacious Carabid, *Calosoma vagans* Dej. *Graphognathus leucoloma* (Boh.), causes limited damage. Stored chickpeas are attacked by *Calandra granaria*, *Sitodrepa panicea* and *Bruchus obtectus*.

Plaut (N.). **A new White Grub on Apple in Israel.**—*FAO Plant Prot. Bull.* **1** no. 11 p. 171. Rome, 1953.

Since 1948, larvae of an unidentified Dynastid of the genus *Pentodon* have caused severe damage to apple seedlings and young apple trees in the eastern part of Upper Galilee, as a result of which the seedlings ultimately died. The larvae, of which usually one and never more than two were found attacking one seedling, fed on the main roots or the underground parts of the stems, which they almost severed at a depth of 2–8 ins. In August 1952, a considerable outbreak occurred in a tree nursery established in the affected area in 1951, although BHC had been ploughed into the soil in February 1952, prior to planting, and neither BHC nor dieldrin applied to the soil by injection or as sprays in August or October gave any control. By October, 1,320 of a total of some 43,000 grafted apple stocks had been destroyed, five varieties being equally affected. Quince, almond and olive in the same nursery were not attacked, but a few reports of heavy damage to grape vines and roses by unidentified Lamellicorn larvae were received from various localities.

Outbreaks and new Records.—*FAO Plant Prot. Bull.* **1** no. 10 pp. 154–157; no. 12 pp. 188–189. Rome, 1953.

The new records include (p. 156) *Diarthronomyia chrysanthemi* Ahlberg on chrysanthemums in New Zealand, and (p. 188) *Phytodecta fornicata* (Brüggem.) in north-eastern Italy. The latter attacks forage crops, notably lucerne.

Norris (D. O.). **Spotted Wilt of Potato. I. The Field Disease and Studies of the causal Virus.**—*Aust. J. agric. Res.* **2** no. 3 pp. 221–242, 6 pls., 12 refs. Melbourne, 1951. **II. Tuber Transmission and Vector Studies of the Field Disease.**—*T.c.* pp. 243–260, 1 fig., 11 refs.

In the first of these two papers on spotted wilt of potato transmitted by *Thrips tabaci* Lind. in Australia [*R.A.E.*, A **39** 41], the symptoms caused on this plant are described in detail and an account is given of investigations at Canberra on the strains that make up the virus complex involved. Five strains of the spotted wilt virus are known, and analyses showed that the virus from potatoes lacked one of them and so differs from the type

commonly occurring in tomato. It is suggested that the complex affecting potato should be designated " potato type spotted wilt ".

The second paper contains accounts of greenhouse and field investigations on the rate of transmission through tubers from plants infected in the field or derived from infected tubers, and of studies near Canberra to determine the vector, the results of which have already been noticed from a less detailed source [*cf. loc. cit.*], with a consideration of the conditions that favour outbreaks of the disease. It is concluded that outbreaks are likely to occur only in seasons when conditions enable populations of *T. tabaci* to build up rapidly in spring and very early summer so that many adults disperse from infected plants before December, when hot, dry conditions normally check breeding. The virus of spotted wilt occurs throughout the world, but has been reported as affecting potatoes only in eastern Australia. The conditions requisite for the development of an outbreak are the presence of highly susceptible varieties, planting dates that enable their most susceptible stage to coincide with maximum activity of the vector, and seasonal conditions allowing early and intensive breeding of the latter. It is assumed that this combination has not yet occurred in other parts of the world.

Balcells R. (E.). **Datos sobre parásitos de** *Heliotropium europaeum*, **L. en Barcelona.** [Notes on Parasites of *H. europaeum* in Barcelona.]—*Publ. Inst. Biol. apl.* **11** pp. 125–139, 17 figs., 18 refs. Barcelona, 1952.

Heliotropium europaeum, an annual weed that grows in dry regions in the Mediterranean basin, has spread in the drier parts of Australia, where it was accidentally introduced, and is regarded as a pest there since it is harmful to cattle. Investigations were begun near Barcelona in 1950 on insects that attack it in its natural habitat, with a view to introducing any thought suitable into Australia against the weed. Various species were found, but the only two of importance were the Pentatomid, *Carpocoris pudicus fuscispinus* (Boh.), and the flea-beetle, *Longitarsus albineus* Foud. The former attacks the seeds of several weeds and also cereals and was found on the inflorescences of *H. europaeum*. Nymphs were present during the first half of August, but only adults were found after 20th August. Adults of *L. albineus* occurred from June to September, were most abundant in July and August, and fed on the leaves of *H. europaeum*. When taken to the laboratory, the females oviposited on the leaves provided or on the glass of the containers, laying 4–15 eggs daily. The larvae hatched in 8 days at 25°C. [77°F.], but all died within a few hours. The egg, larva and adults of both sexes are described.

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Bärner (J.). **Bibliographie der Pflanzenschutzliteratur. Bibliography of Plant Protection . . . 1940–1945. I–II.**—xlviii + 1308 pp. Berlin, P. Parey, 1953. [*Cf. R.A.E.*, A **36** 72.]

Ferrière (C.). **Deux nouveaux parasites** [*Scelio sudanensis* and *S. remaudierei*, spp. n.] **des oeufs de** *Locusta migratoria migratorioides* **en Afrique** [French Sudan].—*Bull. Soc. ent. Fr.* **56** no. 8 pp. 114–118, 4 figs., 7 refs. Paris, 1951.

Lloyd (D. C.). **Parthenogenesis in the Mealybug,** *Phenacoccus solani* **Ferris.**—*Canad. Ent.* **84** no. 10 pp. 308–310, 10 refs. Ottawa, 1952.

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